Christina Comments and Responses

TMDL ID #	*Comment*	*Commenter*	*Response*
01-A-01	However, since the DRWPCC effluent is of exceptional quality satisfying all permit requirements, it is apparent that it is not the source of the existing nutrient problems in the Christina basin. Therefore, further restrictions on the nutrients discharged by the DRWPCC will have no impact on the current nutrients-impaired portions of the Christina River basin.	Herbert J. May	The TMDL model results show that reductions at the Downingtown plant are required, both at the Level 1 and Level 2 assessments, to meet Dissolved Oxygen (DO) standards in the Christina River Basin and specifically protect the DO water quality standard for the East Branch Brandywine Creek. As part of the reductions necessary to meet the DO standards, the model results and the TMDL call for a reduction in the amount of nutrients discharged by Downingtown under design flow conditions. While Downingtown may not be the sole source of existing nutrient problems in the Christina River Basin, any source which discharges nutrients is a contributor of nutrients to the Christina River Basin and must be included in the TMDL analysis and allocation.
01-A-02	The Christina River basin lower reaches are not only impaired during low stream flows, but continuously, indicating a non-point source connection. In order to have any meaningful impact on the problem, priority must be given to identifying and remedying all of the conditions causing the current impairments, whether of point or non-point origin. Once that is done, a strategy for dealing with future conditions can be developed and the model can be refined.	Herbert J. May	EPA agrees that there may be additional problems with water quality in the Christina River Basin other than the low flow problems addressed in this TMDL. There are segments on the states 303(d) lists in the Christina River Basin where problems identified under high flows are identified. As outlined in the TMDL document, a decision was made to proceed first with a low flow TMDL and then perform a high flow TMDL evaluation. The high flow model will be integrated with the low flow model, allowing the assessment requested in this comment to be available. However, the low flow TMDL prepared for these low flow critical conditions described in the TMDL document is unlikely to be changed by the high flow TMDL.

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01-A-03	It is a documented fact that non-point sources are causing the majority of lingering water quality problems nationally and locally, especially with regard to excess nutrient discharges. The low-flow point source model developed by the USEPA does not address this problem. It is a point source model that computes the need for point source reductions of carbonaceous biochemical oxygen demand ("CBOD5"), ammonia nitrogen ("NH3-N"), and total phosphorus ("P") based on critical low-flow conditions, i.e., when the maximum flow from the DRWPCC is discharged to a stream flowing at or near its minimum 10-year, seven-day average flow. Such a scenario is extremely unlikely, as stream and wastewater treatment influent/effluent flows nearly always mirror each other as both are greatly influenced by local precipitation cycles. Therefore the maximum DRWPCC flows occur when stream flows are at or near their maximum, and vice-versa. Even if it were possible for the high discharge low stream flow condition to occur, its contribution to the overall stream quality impairment may be less than the frequent non point source contributions that occur in a stream.	Herbert J. May	EPA agrees with some of these comments. EPA acknowledges that this TMDL does not address special water quality problems from high flow critical conditions. That will be the subject of the high flow TMDL evaluation for the Christina River Basin. For this low flow TMDL, 40 CFR Section 130.7(c)(1) states "Determinations of TMDLs shall take into account critical conditions for stream flow, loading, and water quality parameters." The critical condition can be thought of as the "worst-case" scenario of environmental conditions in the waterbody in which the loading expressed in the TMDL for the pollutants of concern will continue to meet water quality standards. This critical condition analysis is necessary to ensure the chemical, physical, and biological integrity of the waterbody. Data analysis indicated that critical conditions in the Christina River Basin occur during summer and early fall drought periods when stream flow is reduced and temperatures are warmer. Point sources are the dominant contributor of pollutants during these times. EPA characterizes low flow through use of the 7Q10 statistic which is defined as the 7-day average low flow occurring once in 10 years. Since point sources are allowed to discharge at levels specified in NPDES permits, current maximum permitted levels (monthly average discharge limitations) are maximum used during the critical condition analysis. Therefore, it is appropriate to use 7Q10 to characterize reduced steam flows and current permitted levels to define maximum allowable loads within the context of the critical conditions analysis. See 10-J-05.

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01-A-04	A more probable scenario is that nutrients are entering the receiving stream in large quantities through non-point sources such as agricultural and urban storm runoff during rain events. Nitrogen and phosphorus compounds entering the stream during these events then pass through swifter upstream reaches to be caught in the slower, wider streams of the lower reaches. The Christina River non-point source TMDL ("high-flow model") is being developed separately from the current document to address this problem; however, it is several years away from completion and adoption. Since it is clear that nonpoint,sources are a major factor in the excess nutrient problem, the high-flow model must be completed and the results of that effort compared to those provided by the low-flow model before any assumptions can be made regarding the problem.	Herbert J. May	EPA, the states and the Delaware River Basin Commission (DRBC) intend to complete the high flow TMDL and make recommendations for reductions from those sources assessed in the high flow evaluation as appropriate. However, based on currently available information the low flow TMDL prepared for critical conditions described in the Decision Rationale document is unlikely to be changed by development of a TMDL to address high flow critical conditions.
01-A-05	Predictions made by the low-flow model for the East Branch Brandywine Creek as shown in Appendix H greatly under estimate the dissolved oxygen levels of the receiving stream and over estimate the pollutant loadings to the receiving stream when compared to actual observed levels (Figs. H07-H08). Its ability to predict the impacts of the point source discharges during critical conditions is therefore questionable and needs further review.	Herbert J. May	EPA disagrees. The Figures in Appendix H of the Hydrodynamic and Water Quality Model of Christina River Basin, EPA, May 31, 2000 ('Model Report') show the model results under critical conditions with the NPDES facilities discharging at their existing permitted flows and loads. These figures are not the calibration or validation results. The observed data displayed on these figures are from the period August 1 to September 21, 1997 (the calibration period) and are shown for reference only and are not an indication of model performance.

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01-A-06	The Authority has been told that the development and implementation of the low-flow model is being accelerated to meet the terms of a Consent Decree reached between the USEPA, the state of Delaware and several environmental groups. However, the Consent Decree only mandated the timely development of a TMDL for those impaired water bodies listed on the state of Delaware's 303d list. It did not impose such requirements for Pennsylvania. The East Branch Brandywine Creek is located entirely within Pennsylvania. Therefore, there is no legal basis for imposing further restrictions on point source nutrient discharges within the East Branch Brandywine Creek.	Herbert J. May	As discussed in the proposed TMDL and enclosed final TMDL Decision Rationale document, EPA has prepared this low flow TMDL using the Watershed Protection Approach consistent with EPA's authority to establish TMDLs under Section 303(d) of the Clean Water Act and 40 CFR 130.7. Based on available water quality data, conditions in the downstream segments of the Christina River Basin are impacted by tributary loads from upstream segments including the East Branch Brandywine Creek. The Watershed Protection Approach calls for an evaluation of all relevant loads in a defined watershed. To address downstream Delaware impairments for DO, EPA along with participating state agencies and DRBC decided to establish a watershed TMDL. EPA believes this is the most equitable, most resource efficient and most environmentally prudent course of action available. EPA has therefore decided that the TMDL for the Christina River Basin must include the full watershed, including the East Branch Brandywine Creek.

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01-A-07	Rapid urbanization of the County and within the East Branch Brandywine Creek basin have caused the Pennsylvania Department of Environmental Protection to list the receiving stream on its 303d list as an "impaired water body" due to increased siltation, flow and habitat alterations, and hydromodification. None of 303d-listed sources of impairment for this stream relate to point source discharges. Therefor the state of Pennsylvania has established no technical basis for developing the nutrients TMDL under the 303 regulations. One is required. Section 130.51 of USEPA's recently-revised Water Quality Planning and Management Regulations states that water quality planning must be based on initial water quality management plans produced in accordance with sections 208 and 303(e) of the Clean Water Act and certified and approved updates to those plans. That section further states that the annual water quality planning should focus on priority issues and geographic areas identified in the latest 305(b) reports. Since a nutrients requirement for the East Branch Brandywine Creek is apparently not included on the state of Pennsylvania's current water quality management plan, this condition is not met. Developing a TMDL for an unlisted condition diverts funding and efforts away from the priority areas of the list.	Herbert J. May	EPA did recently enact new TMDL regulations but those regulations are not yet effective. See 65 Federal Register 43586-43670, specifically 43660 (7/13/00). This TMDL was developed under current regulations at 40 CFR 130.7. Therefore, this comment and reference is not appropriate for this particular TMDL. However, Delaware has identified nutrients as pollutants of concern in the Christina River Basin. In order to consider and address all potential sources of nutrients to Delaware's waters, it was necessary to include the potential sources originating in Pennsylvania. The analysis performed for this TMDL revealed that there were local nutrient concerns in Pennsylvania as well as in Delaware. This water quality modeling analysis was then used to establish necessary controls in order to address the local impacts as well as any impacts that may be occurring in the tidal Christina River. Note that the existing implementing regulations identify water quality modeling results as a data source for identifying waters for listing on the section 303(d)list of waters (40 CFR 130.7 (b) (5) (ii).
01-A-08	If the state of Pennsylvania has developed a Water Quality Management Plan for East Branch Brandywine Creek, does it include the mandatory requirements for such plans as detailed in sections 130.51(c).3 and 4, i.e., financial arrangements for any municipal and industrial waste treatment works, including facilities for treatment of storm water-induced combined sewer overflows, and a description of the regulatory and non-regulatory programs, activities and best management practices which the agency has selected as the means to control nonpoint source pollution where necessary to protect or achieve approved water uses?	Herbert J. May	The comment references an EPA regulation citation that is not yet effective. See response to 01-A-07. Under current regulations at 40 CFR 130.6, a TMDL is one of several elements of a Water Quality Management Plan (WQMP). Whether the state has a WQMP or not does not relieve the state or EPA from completing the necessary TMDLs. As a WQMP is developed these completed TMDLs then would become a part of that plan.

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01-A-09	130.51(c).5 also requires management agencies to demonstrate the legal, institutional, managerial and financial capability and specific activities necessary to carry out their responsibilities in accordance with section 208(c)(2)(A) through (1) of the Act. Has this requirement been met? ,	Herber J. Mays	The comment references an EPA regulation citation that is not yet effective. See response 01-A-07. Under Current regulation at 40 CFR 130.6, the comment describes a required element of a WQMP, just as a TMDL is an element of a WQMP. Development of such elements as described by this comment is not a pre-requisite of completing a necessary TMDL
01-A-10	The USEPA has developed the low flow TMDL model on behalf of the state of Delaware, and applied the results of that model to Pennsylvania. Since it has developed the TMDL, the USEPA is also responsible for providing the reasonable assurance described in 40 CFR Part 130.2(p). Specifically, the USEPA has failed to show reasonable assurance that management measures or other control actions to implement the non point source load allocations developed in the subsequent high flow model will be implemented as expeditiously as practical, will be accomplished through reliable and effective delivery mechanisms, and will be supported by adequate funding. Will the USEPA assume the duties of Pennsylvania in that regard including those listed in paragraphs 5 and 6 above? The PADEP has not even confirmed a nutrients control priority/strategy for the East Branch Brandywine Creek as required by the 303d list.The USEPA must demonstrate such reasonable assurance before the TMDL can be implemented. That would seem difficult now, as the high flow model is not yet developed.	Herbert J. May	EPA agrees that it would be difficult to develop a reasonable assurance for implementing a TMDL that has yet to be completed. As has been described, this TMDL for the Christina River Basin has been developed for low flow (or dry weather) critical conditions. Therefore the reasonable assurance discussion for this TMDL in Section VII. 8 of the Decision Rationale document appropriately addresses those specific conditions and control requirements. Expecting EPA to develop a reasonable assurance for a TMDL that will address another critical condition and that is not yet complete is inappropriate. The commenter may be confused between nonpoint source impacts at low flow and nonpoint source impacts during wet weather, higher flow conditions, as well as the relative importance of point source contributions. The commenter is referred to several other comments (e.g., 12-L-10) and their responses regarding this issue.
01-A-11	TMDL simulations indicate that the model greatly under estimates dissolved oxygen levels within the receiving stream and over estimates the levels of ammonia nitrogen, nitrate, total phosphorus, orthophosphate, and dissolved and total organic carbon caused by worst-case point source discharges (figures H07- H08).	Herbert J. May	EPA disagrees. The figures in Appendix H of the Model Report show the model results under critical conditions with the NPDES facilities discharging at their existing permitted flows and loads. These figures are not the calibration or validation results. The observed data displayed on these figures are from the period August 1 to September 21, 1997 (the calibration period) and are shown for reference only and are not an indication of model performance

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01-A-12	STORET data is quoted as the source for much of the background water quality data used in model calibration and verification, yet the STORET data obtained by the Authority from USEPA to date is extremely limited for the East Branch Brandywine Creek below Downingtown, including as little as one data point for the various nitrogen and phosphorus parameters. The 10th percentile base line concentrations used in the model appear low when compared to the STORET data reviewed by the Authority. Additional data is needed to support any background concentrations, assumptions on nonpoint source contributions, etc.	Herbert J. May	EPA disagrees that additional data is necessary to support the TMDL calculations. Additional monitoring data is always useful for water quality modeling studies. The analysis for this TMDL was performed using available data consistent with 40 CFR 130.7 and drew upon several special monitoring studies performed by agencies in the Christina River Basin for this TMDL.
01-A-13	In the absence of the high-flow model, the model developers have assumed certain background concentrations that are multiplied by unit flow values to compute non-point source load allocations for each reach. Developing the load and waste load allocations in this manner neglects to account for the improvements in the non-point source discharge quality that will result from non-point source controls (i.e., the background concentrations should be reduced through non-point source control).	Herbert J. May	The TMDL was conducted for low-flow summer conditions during which little runoff or loading is expected from nonpoint sources. Nonpoint source controls will have impacts on improving water quality for high flows that occur during rainfall events, but will not have significant effects during low-flow conditions. Nonpoint source issues due to variable flow will be considered under the high flow TMDL.
01-A-14	Was Q30-10 used in developing the ammonia nitrogen limits per PA Chapter 96?	Herbert J. May	The allocated ammonia limits for all Pennsylvania NPDES dischargers in the Christina River Basin were protective of the ammonia toxicity criteria at the 7Q10 flow rates, so there was no need to check the criteria at the higher 7Q30 flow rates. The ammonia reductions in Pennsylvania were made to allow the receiving stream to achieve the DO water quality standard.

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02-B-01	The Authority believes the USEPA has failed to sufficiently prove a link between the current discharge of nutrients by the point source dischargers and the ongoing nutrients/DO problems occurring near Wilmington, yet through this low-flow model, it is pursuing additional point source reductions based on projected future conditions;	Herbert J. May	EPA disagrees. Under the baseline condition in which all NPDES facilities were set to discharge at their existing maximum allowable permit flows and loads, the model indicated that a small portion of the tidal Christina River was not achieving the daily average dissolved oxygen standard (see Figure 8 in the TMDL Decision Rationale document). In addition, various stream segments in East and West Branches of the Brandywine Creek, Red Clay Creek, and West Branch Christina River were also not achieving the dissolved oxygen standards according to the TMDL model. The TMDL allocations were made using the equal marginal percent removal (EMPR) strategy explained on pages 34 - 41 of the TMDL Decision Rationale document. After the Level 1 and Level 2 allocations of the EMPR strategy were made to the NPDES facilities inside the Christina River Basin, the model indicated all freshwater streams as well as the entire tidal Christina River were meeting the dissolved oxygen standards. Therefore, the TMDL model does, indeed, indicate a link between the discharge of nutrients from point sources inside the Christina River Basin and the DO impairment in the Christina River near the mouth of Brandywine Creek.
02-B-02	The proposed reductions in point source discharges within the basin have been developed by the USEPA using "worst-case" assumptions that have very little chance of occurring, while the development of a high-flow model that will address the frequent non-point source discharges that do occur is potentially years away from completion;	Herbert J. May	The design conditions employed in this low flow TMDL are standard methodologies, and as noted in the TMDL Decision Rationale document, used by all states in the Christina River Basin as the design or critical conditions for the application of water quality criteria in their Water Quality Standards. See 01-A-03. This approach also provides an implicit margin of safety. The high flow TMDL will be completed by December 2004.

TMDL ID #	Comment	Commenter	Response
02-B-03	The East Branch Brandywine Creek is not listed on the state of Pennsylvania's 303d list as being nutrient-impaired. Developing a TMDL for an unlisted condition diverts funding and efforts away from higher priority projects on the list.	Herbert J. May	As discussed in the Decision Rationale document, EPA has prepared this low flow TMDL using the Watershed Protection Approach consistent with EPA's authority to establish TMDLs under Section 303(d) of the Clean Water Act. Based on available water quality data, conditions in the downstream segments of the Christina River Basin are impacted by tributary loads from upstream segments such as the East Branch Brandywine Creek. The Watershed Protection Approach calls for an evaluation of all relevant loads in a defined watershed. To address downstream Delaware impairments for DO, EPA along with participating state agencies and DRBC decided to establish a watershed TMDL. EPA believes this is the most equitable, most resource efficient and most environmentally prudent course of action available. Also, using the model shows that portions of the East Branch of the Brandywine Creek would experience DO violations at critical conditions. See Figure 8 in Decision Rationale document. EPA has therefore decided that the TMDL for the Christina River Basin must include the full watershed, including the East Branch Brandywine Creek.
02-B-04	The USEPA supports its accelerated development of the low-flow TMDL under the basis that it is required by a Consent Decree. However, the Consent Decree does not include Pennsylvania.	Herbert J. May	EPA is exercising its discretionary authority to establish a watershed TMDL for the Christina River Basin low flow problems of DO and nutrients using the Watershed Protection Approach. See 01-A-06 or 02-B-03.
02-B-05	The USEPA has failed to develop the TMDL in accordance with its recently-revised Water Quality Planning and Management Regulations which require the preparation and submittal of a water quality management plan by the states prior to development of a TMDL.	Herbert J. May	EPA did recently enact new TMDL regulations but those regulations are not yet effective. See 65 Federal Register 43586-43670, specifically 43660 (7/13/00). This TMDL was developed under current regulations at 40 CFR 130.7. Therefore, this comment and reference is not appropriate for this particular TMDL.
02-B-06	The mandatory contents for such water quality plans, such as demonstrating that sufficient financial arrangements for any municipal or industrial waste treatment works or regulatory and non-regulatory programs, activities and best management practices are in place, have not been provided.	Herbert J. May	These items are not required elements of an approvable TMDL under current regulations at 40 CFR 130.7 and therefore do not need to be addressed in an approved TMDL.

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02-B-07	The USEPA has failed to provide reasonable assurance that management measures or other control actions necessary to implement the non-point source load allocations to be developed in the subsequent high flow model will be implemented as expeditiously as practical, will be accomplished through reliable and effective delivery mechanisms, and will be supported by adequate funding.	Herbert J. May	EPA believes that it would be difficult to develop a reasonable assurance for implementing a TMDL that has yet to be completed. As has been discussed on numerous occasions, this TMDL for the Christina River Basin has been developed for low-flow critical conditions. Therefore the reasonable assurance discussion appropriately addresses those specific conditions and control requirements. Expecting EPA to develop a reasonable assurance for a TMDL that is not yet complete is inappropriate. The commenter is referred to several other comments (e.g. 11-L-10) and their responses regarding this issue.
02-B-08	Future funding for the TMDL rule is in jeopardy based on the current political climate in Washington, and lacking such future funding, the USEPA will be unable to complete the highflow model and only point source reductions will be implemented. Such goals are contrary to the purpose of the TMDL Rule.	Herbert J. May	Funding speculation related to the future of TMDL development cannot be factored into the decisions affecting TMDL completion. At this date, EPA fully expects the high flow model to be completed by December 2004. The low flow TMDL calculations are applicable to their design critical conditions and would remain applicable even if the high flow TMDL can not be completed.
03-C-01	We have seen no evidence that point source discharges are the primary cause of the water quality problems in the Christina River Basin; however, the emphasis for correction appears to be the point source discharges.	Thomas Brown	This low flow TMDL addresses the impacts of point source discharges in the Christina River Basin. Section 303(d) lists submitted by states in the Christina River Basin have identified point sources as a contributor to water quality problems in the Christina River Basin. The TMDL model runs conducted in the establishment of this TMDL confirmed that point sources evaluated at their existing permit limits under the design conditions used in this TMDL would produce violations of DO standards. See e.g. Figure 8 of Decision Rationale document.

TMDL ID #	Comment	Commenter	Response
03-C-02	On the Pennsylvania 303(d) list of impaired streams, the East Branch Brandywine Creek is not listed as an impaired stream, yet TMDLs are being set for the East Branch Brandywine Creek.	Thomas Brown	As discussed in the Decision Rationale document, EPA has prepared this low flow TMDL using the Watershed Protection Approach consistent with EPA's authority to establish TMDLs under Section 303(d) of the Clean Water Act and 40 CFR 130.7. Based on available water quality data, conditions in the downstream segments of the Christina River Basin are impacted by tributary loads from upstream segments such as the East Branch Brandywine Creek. The Watershed Protection Approach calls for an evaluation of all relevant loads in a defined watershed. To address downstream Delaware impairments for DO, EPA along with participating state agencies and DRBC decided to establish a watershed TMDL. EPA believes this is the most equitable, most resource efficient and most environmentally prudent course of action available. EPA has therefore decided that the TMDL for the Christina River Basin must include the full watershed, including the East Branch Brandywine Creek.
03-C-03	On the Pennsylvania 303(d) list of impaired streams within the Christina River Basin, the most prominently listed source of stream impairment is "agriculture". In fact, agricultural lands comprise 40% of the Pennsylvania land use within the Christina River Basin. However, the focus of the Step 1 TMDLs is point source discharges, rather than agriculture.	Thomas Brown	EPA does not dispute that "agriculture" has been identified by the states on their 303(d) lists as a prominent source of stream impairment. Siltation, a separate pollutant from those being evaluated under this low flow TMDL is cited for a number of segments with agricultural use as a likely source. As discussed in the Decision Rationale document, nonpoint source loads, including agricultural, are assessed and a background contribution load is calculated under the critical conditions of low flow used in this TMDL. No reductions of these backgrounds are determined necessary to meet water quality standards under the critical conditions addressed by this low flow TMDL. Agricultural sources will undergo further evaluation during the development of the TMDL addressing high flow critical conditions for the Christina River Basin.

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03-C-04	In section VII, item 8) of the EPA document entitled "Draft Total Maximum Daily Load of Nutrients and Dissolved Oxygen in the Christian River Basin, Pennsylvania, Delaware, and Maryland", EPA discussed the reasonable assurances that TMDL can be met. EPA gives assurances that point source discharge limits will be met through the NPDES permitting program. With respect to nonpoint source TMDLs EPA states: "Reductions from the current load allocations are unnecessary." "The feasibility of control measures necessary to reduce current non-point source pollutant loadings is highly questionable." In other words, it appears that EPA is conceding that the burden of water quality improvement will be placed on point source discharges rather than spreading the burden over both point and non point source discharges. We believe that this is contrary to the purpose of the TMDL regulations.	Thomas Brown	Revisions will be made to the Decision Rationale document to clarify these statements. The context of the statement on the feasibility of control measures for nonpoint sources was intended for the background nonpoint source loads assessed in this low flow TMDL. EPA contends that controls on nonpoint sources are feasible and expects that the high flow TMDL and its subsequent implementation plan will make this clear.
03-C-05	Non-point source discharges, for all practical purposes, will be addressed in the Step 2 TMDL process, which is in progress and not required to be completed until December 2004. We Believe that Step 1 and Step 2 modeling should be done concurrently, as non-point source loadings have an impact on the stream quality, even during dry weather.	Thomas Brown	EPA, the states and the DRBC will complete the high flow TMDL and make recommendations for reductions from those sources assessed in the high flow evaluation as appropriate. However, the low flow TMDL prepared for critical conditions described in the Decision Rationale document is unlikely to be changed by the high flow TMDL. The low flow TMDL can be completed independent of the high flow TMDL as different critical conditions are employed. Assessment of nonpoint source loads during dry weather have been incorporated in the low flow TMDL through the assessment of background nonpoint source contributions.
03-C-06	The Step 1 model used by EPA is unrealistically conservative, resulting in point source discharge limits that are more stringent than necessary.	Thomas Brown	The TMDL model itself is not unrealistically conservative. It incorporates the best available science into the hydrodynamic and biochemical processes that describe the oxygen-carbon-nitrogen-phosphorus cycle.

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03-C-07	The Brandywine River and its tributaries impact the water quality of only a small portion of the Christina River. That portion of the Christina is tidal. The water quality of the tidal portion of the Christina River is also impacted by the Delaware River and the point source discharges to the Delaware. The contaminant loads contributed by the 23 point source discharges in the limited segment of the tidal portion of the Delaware River considered by EPA are substantially greater than the contaminant loads contributed by the Brandywine River. However, there are no contaminant load reductions proposed for any of the Delaware River discharges.	Thomas Brown	Under the baseline condition in which all NPDES facilities were set to discharge at their existing permit flows and loads, the TMDL model indicated that a small portion of the tidal Christina River was not achieving the daily average DO standard (see Figure 8 in the TMDL Decision Rationale document). As noted in the Decision Rationale document, the tidal estuary portion of the TMDL model was able to consider potential impacts within the Christina River Basin from pollutant loads from the applicable portion of the Delaware River. Various stream segments in Brandywine Creek, Red Clay Creek, and West Branch Christina River were also not achieving the dissolved oxygen standards according to the model. However, in the Delaware River, the TMDL model did not indicate any problems with the Delaware River segments achieving DO standard. The TMDL allocations were made using the equal marginal percent removal (EMPR) strategy explained on pages 34 - 41 of the TMDL Decision Rationale document. After the Level 1 and Level 2 allocations of the EMPR strategy were made to the NPDES facilities inside the Christina River Basin, the TMDL model indicated all freshwater streams as well as the entire tidal Christina River were meeting the DO standards. Therefore, there was no need for any further allocations to NPDES facilities discharging to the Delaware River outside the Christina River Basin. See responses to 05-E-01-A, -B and -C.
03-C-08	If the Tier 2 TMDLs are implemented, as proposed, the cost to upgrade the Downingtown treatment plant will probably cost millions of dollars, which will place a substantial financial burden on the users of the Uwchlan Township sewer system. We believe that is unfair and inequitable since other discharges to the Christina River Basin, namely the non-point source discharges and the major point source discharges into the Delaware River, are not also required or probably will not be required to reduce their pollutant loadings into the Christina River basin.	Thomas Brown	Speculation on the costs for any planned improvements at facilities in the Christina River Basin as a result of the low flow TMDL are premature. An implementation plan to achieve the requirements of the TMDL will be developed after the TMDL is established. Cost estimates for any required improvements will be evaluated at that time.

TMDL ID #	Comment	Commenter	Response
04-D-01	First, we found the organization of the draft TMDL to detract from its purpose. The most crucial aspects of the TMDLs should be identified early in the document, and not relegated to latter pages. For example, the document does not even identify applicable water quality standards and waste load allocations until pages 27 and 32, respectively.	Bonnie Dahl	To assist in an organization of critical aspects of the TMDL, EPA has prepared an Executive Summary and included it in the Decision Rationale document.
04-D-02	The "Historical Perspective" and discussion of public participation, we submit are gratuitous, and at times simply wrong. They should be removed, or in the least, demoted to an appendix, if anything.	Bonnie Dahl	EPA contends these sections are helpful, and in the case of the discussion of public participation, one of the regulatory requirements for the establishment of TMDLs. These sections will remain in the Decision Rationale document and revised as necessary.
04-D-03	Second, inexplicably, the document fails to identify the existing actual relevant total loads and observed DO and nutrient concentrations under critical conditions in the Christina basin. Given that it is a basin-wide TMDL, the document should identify the basin-wide loads that affect DO and nutrients.	Bonnie Dahl	Tables 12 through 27 in the TMDL Decision Rationale document provide specific waste load allocations for dischargers in the basin as well as load allocations for subwatersheds in the Christina River Basin.
04-D-04	Third, the draft TMDL does not adequately account for model uncertainty. The underlying water quality model used to generate the TMDL is flawed in at least three important respects.	Bonnie Dahl	See responses 04-D-04A, 04-D-04B, 04-D-04C and 04-D-04A.
04-D-04-A	It assumes that full sunlight is available to all the stream segments throughout the watershed. To the contrary, most riparian stream reaches, particularly in the upper portions of the basin, are at least partially shaded. This incorrect assumption accordingly skews all of the DO and nutrient calculations by overestimating photosynthesis rates.	Bonnie Dahl	The underlying TMDL model is not flawed with respect to its treatment of available sunlight. The TMDL model incorporates a shade factor which can be applied individually to each grid element to account for shading effects. Canopy cover data for all stream reaches in the Christina River Basin were not available. It was decided to assume full sunlight everywhere in the basin to represent worst-case critical conditions and add to the implicit margin of safety.
04-D-04-B	It at times also underestimates photosynthesis rates for systems that are saturated with phosphorus and other nutrients, such as the Red Clay Creek below Kennett Square. Assuming that there is room for any additional loading is simply unsupportable.	Bonnie Dahl	EPA disagrees. The photosynthesis rates downstream of the Kennett Square WWTP are apparently represented very well in the TMDL model as depicted in the dissolved oxygen shown in Figure A22. In this figure, it is apparent that the model minimum and maximum dissolved oxygen matches almost exactly the observed minimum and maximum concentrations downstream of Kennett Square (river mile 103.2).

TMDL ID #	Comment	Commenter	Response
04-D-04-C	It incorrectly predicts that benthic algae biomass growth peaks during the vernal period, and reaches a minimum during the summer. This is just plain wrong, and correspondingly predicts much higher allowable loading levels than clearly is the case.	Bonnie Dahl	The starting conditions for the benthic algal biomass (day 121) for the TMDL model calibration and validation runs may have been initialized higher than one might expect. However, no observed data were available to confirm or deny this starting condition. Also, the TMDL model was calibrated for the late summer (August-September) critical period, not the starting period in May. The first month of the calibration and validation periods was considered as the model spin up period when the various model parameters were moving toward their "dynamic equilibrium" conditions. If one ignores the first month of the simulation, the benthic algae shown in the figures in Appendix B of the Model Report indicate a fairly steady biomass from June (day 152) through mid-August (day 225) with an increase during late summer at most locations. An example of how the benthic algae in the model responds to loading levels can be seen by comparing Figures B15 and B16 (West Branch Red Clay Creek) with the results on Figures B31 and B32 (Pike Creek). At the West Branch Red Clay Creek location, the available phosphorus and nitrogen concentrations are high and the corresponding benthic algae biomass is also large (about 1000 ug/L). Conversely, at the Pike Creek location the phosphorus and nitrogen concentrations are low and the benthic algae is also very low (less than 10 ug/L).
04-D-04-D	It grossly under reports the effect of sediment activities. The model was developed for estuaries systems of the Chesapeake Bay. It is not appropriate for the rocky, sandy or granular sediment components existing in the freshwater systems throughout the basin.	Bonnie Dahl	There is no basis for implying that the TMDL model "grossly under reports the effect of sediment activities." The Christina River Basin TMDL model accounts for potential sediment effects on DO through the use of the Sediment Oxygen Demand (SOD) variable. SOD is accounted for during the TMDL analysis and allocation scenarios and is based on literature values as well as site-specific SOD data gathered by DNREC. The sediment diagenesis submodel of the TMDL model is applicable to both estuary and fresh water systems. Please refer to section 5.3.5 in the Model Report for documentation on how the model utilizes either methane or sulfate depending on whether the overlying water column is a saline or fresh water system.

TMDL ID #	Comment	Commenter	Response
04-D-05	The insufficiency of the model is displayed by noting that it does not predict water quality impacts well when compared to actual, available, significant databases.	Bonnie Dahl	The TMDL model was calibrated using data collected in 1997 and validated using data collected in 1995 with both years experiencing low-flow periods comparable to 7Q10 conditions used for the low flow TMDL. The results of the calibration and validation are presented in the Model Report. As presented in Section 11 of the Model Report, relative error statistics for dissolved oxygen, carbon, nitrogen, and phosphorus are within the acceptable guidance for water quality models published in Technical Guidance Manual for Performing Waste Load Allocations, EPA, 1990.
04-D-06	Fourth, the draft TMDL ignores important influences on allowable loadings. For example, there is no discussion of violations of pH on the East and West Branch Brandywine. These violations are a product of changes in algal photosynthesis, which in turn affects nutrient concentrations. Yet inexplicably the report does not account for these pH violations, thus predicting even greater allowable loadings than what is the case in the basin.	Bonnie Dahl	Water Quality Standards for DO, not pH, are appropriately used as the water quality target of this TMDL. EPA believes that the pH criteria violations are directly coupled with photosynthesis and respiration which occurs in the stream in response to excess nutrient loading. EPA further believes that controls on nutrients as established in this TMDL will address the pH violations.

TMDL ID #	Comment	Commenter	Response
04-D-07	Last, the draft TMDL contains several gratuitous, debatable, and erroneous comments about the legal underpinnings of TMDLs, and often misquotes or misconstrues existing legal requirements. It assumes that there are not control measures to reduce nonpoint contributions. It assumes, without discussion, that pollutant reductions are not economically practicable for several point sources. It assumes an implied margin of safety, but provides no actual margin. It assumes no water quality violations for many stream reaches, even though actual and recent data show otherwise.	Bonnie Dahl	As previously stated, EPA does believe that nonpoint source control mechanisms, such as BMPs, must be implemented to control overland sources of pollutant loadings during precipitation events and high flow periods. The final sentence in part 8 (Reasonable Assurance) of Section VII (discussion of Regulatory Conditions) of the Decision Rationale document is applicable within the context of the critical conditions of this TMDL. The lack of precipitation events, as is typical during critical low-flow conditions, causes one to question the effectiveness of traditional BMP measures which are designed on the premise of overland flow. This statement is also meant to clarify why EPA believes that reductions in point sources are necessary during critical conditions to provide reasonable assurance that the TMDL can be met. The Decision Rationale document will be revised to clarify this issue. Economic feasibility did not specifically determine the nature and magnitude of pollutant reductions in the Christina River Basin. Without knowing which specific point sources the commenter refers to, EPA can not provide a more specific response. The requirement to include a margin of safety (MOS) stems from the need to account for uncertainty in the modeling process. Accounting for uncertainty can be done either through an explicit or implicit approach. Neither method is more appropriate than the other. It is more important to consider and address uncertainty than it is to use a particular method. EPA believes that use of implicit MOS within this model is appropriate. The nature of implicit margins of safety precludes quantifying an actual MOS load. Please refer to the response to comment 11-L-48 regarding modeled segments and related 303(d) listed segments.

TMDL ID #	Comment	Commenter	Response
05-E-01	The Brandywine River and its tributaries impact the water quality of only a small portion of the Christina River. That portion of the Christian River is tidal. The water quality of the tidal portion of the Christina River is also impacted by the Delaware River and the point source discharges to the Delaware River, as acknowledged by EPA in the draft TMDL document (Section VII, Item). We have several concerns.	Doug Hanley	The Decision Rationale document states that any discharge into the Delaware River above and below the confluence of the Christina River and the Delaware River could potentially impact water quality within the tidally influenced portions of the Christina River Basin. As discussed in the responses to 03-C-07 and 05-E-01B, a planned Level 3 evaluation for facilities within the defined portion of the Delaware River proved unnecessary.
05-E-01-A	When considering the impact of the Delaware River and its point source discharges on the tidal portion of the Christina River, EPA considered only a small portion of the Delaware River watershed (10 miles above and below the confluence of the Christina with the Delaware), which includes 23 point source discharges. No other Delaware River basin point source or non-point source discharges were considered.	Doug Hanley	Point sources in the Delaware River were considered within an approximate 10-mile distance from the mouth of the Christina River. The tidal excursion zone in this area of the Delaware River is about 8 miles. Therefore, it was decided to locate the upstream and downstream boundaries of the Delaware River at least one tidal excursion length from the mouth of the Christina River. All point sources located within the model domain were also included in the TMDL model.
05-E-01-B	The volume of contaminant discharged by the 23 point source discharges within the 20 mile segment of the Delaware River are many times greater than the volume of contaminants discharged by the point source discharges into the Brandywine River. However, even though contaminant loads from Brandywine River discharges must be reduced, none of the 23 Delaware River point source discharges will be required to reduce contaminant loads (refer to EPA Table 28).	Doug Hanley	As outlined in the Decision Rationale document, EPA proceeded through a Level 1 and then a Level 2 discharge evaluation of facilities that discharge within the physical boundaries of the Christina River Basin. Reductions from this evaluation were deemed adequate to protect DO standards and a planned Level 3 evaluation for facilities within the defined portion of the Delaware River proved unnecessary. See 03-C-07.
05-E-01-C	In the draft TMDL document, with respect to the impact of Delaware Estuary pollutant loads on the Christina River, EPA states "...explicit analyses to determine the exact nature and magnitude of impacts to water quality in the tidal portions of the Christina River Basin from increased or decreased pollutant loads from the Delaware Estuary has not been performed. "It appears, therefore, that a major of pollution impact on the tidal portion of the Christina River (the Delaware Estuary), is being ignored or glossed over, while imposing more stringent requirements on the discharges into the East Branch Brandywine Creek. We believe this is inequitable.	Doug Hanley	EPA did consider pollutant impacts from dischargers on the Delaware River in the TMDL and are included in the TMDL analysis and allocation scenarios. Those loadings are included in table 28. EPA believes it was not necessary nor appropriate to include these as waste load allocations since they are located outside of the Christina River Basin. However, the impact of those pollutant loadings are considered within the TMDL model. The statement was meant to indicate that sensitivity analyses have not been performed to determine the effects from varied loadings of Delaware River discharges on water quality of the tidal portions of the Christina River Basin.

TMDL ID #	Comment	Commenter	Response
05-E-02	We have seen no evidence that point source discharges are the primary cause of the water quality problems in the Christina River Basin; however, the emphasis for correction appears to be the point source discharges.	Doug Hanley	This low flow TMDL addresses the impacts of point source discharges in the Christina River Basin. Section 303(d) lists submitted by states in the Christina River Basin have identified point sources as a contributor to water quality problems in the Christina River Basin. The TMDL model runs conducted in the preparation of this TMDL confirmed that point sources evaluated at their permit limits under the design conditions used in this TMDL can produce violations of DO standards. For an example of evidence of water quality impairment due to a point source discharge, refer to Figure A22 for the West Branch Red Clay Creek. Notice the observed dissolved oxygen concentrations at river mile 103.2. The observed minimum DO is 2.0 mg/L whereas the minimum DO water quality standard is 4.0 mg/L in this stream. The location of this monitoring station is downstream of the Kennett Square WWTP (PA0024058).
05-E-03	On the Pennsylvania 303(d) list of impaired streams, the East Branch Brandywine Creek is not listed as an impaired stream, yet TMDLs are being set for the East Branch Brandywine Creek.	Doug Hanley	As discussed in the Decision Rationale document, EPA has prepared this low flow TMDL using the Watershed Protection Approach consistent with EPA's authority to establish TMDLs under Section 303(d) of the Clean Water Act.. Based on available water quality data, conditions in the downstream segments of the Christina River Basin are impacted by tributary loads from upstream segments such as the East Branch Brandywine Creek. The Watershed Protection Approach calls for an evaluation of all relevant loads in a defined watershed. To address downstream Delaware impairments for DO, EPA along with participating state agencies and DRBC decided to establish a watershed TMDL. EPA believes this is the most equitable, most resource efficient and most environmentally prudent course of action available. EPA has therefore decided that the TMDL for the Christina River Basin must include the full watershed, including the East Branch Brandywine Creek. See 02-B-03.

TMDL ID #	Comment	Commenter	Response
05-E-04	On the Pennsylvania 303(d) list of impaired streams within the Christina River Basin, the most prominently listed source of stream impairment is "agriculture". In fact, agricultural lands comprise 40% of the Pennsylvania land use within the Christina River Basin. However, the focus of the Step 1 TMDLs is point source discharges, rather than agriculture.	Doug Hanley	EPA does not dispute that “agriculture” has been identified by the states on their 303(d) lists as a prominent source of stream impairment. Siltation, a separate pollutant from those being evaluated under this low flow TMDL is cited for a number of segments with agricultural use as a likely source. As discussed in the Decision Rationale document, nonpoint source loads, including agricultural, are assessed and a background contribution load is calculated under the critical conditions of low flow used in this TMDL. No reductions of these backgrounds are determined necessary for this low flow TMDL. Agricultural sources will undergo further evaluation during the development of the high flow TMDL for the Christina River Basin.
05-E-05	In Section VII, Item 8 of the EPA document entitled "Draft Total Maximum Daily Load of Nutrients and Dissolved Oxygen in the Christina River Basin, Pennsylvania, Delaware, and Maryland". EPA discussed the reasonable assurances that TMDLs can be met. EPA gives assurances that point source discharge limits will be met through the NPDES permitting program. With respect to non-point source TMDLs, EPA states:"Reductions from the current load allocations are unnecessary." "The feasibility of control measures necessary to reduce current nonpoint source pollutant loadings is highly questionable." In other words, it appears that EPA is conceding that the burden of water quality improvement will be placed on point source discharges rather than spreading the burden over both point and non-point source discharges. We believe that this is contrary to the intent of the TMDL regulations, which is that TMDLs address all discharges (point source and non-point source) into a water body.	Doug Hanley	Revisions will be made to the Decision Rationale document to clarify these statements. The context of the statement on the feasibility of control measures for nonpoint sources was intended for the background nonpoint source loads assessed in this low flow TMDL. EPA contends that controls on nonpoint sources are feasible and expects that the high flow TMDL and its subsequent implementation plan will make this clear.

TMDL ID #	Comment	Commenter	Response
05-E-06	Non-point source discharges, for all practical purposes, will be addressed in the Step 2 TMDL process, which is in progress and not required to be completed until December 2004. We believe that Step 1 and Step 2 modelling should be done concurrently, as non-point source loadings have an impact on the stream quality, even during dry weather.	Doug Hanley	EPA, the states and the DRBC intend to complete the high flow TMDL and will make recommendations for reductions from those sources assessed in the high flow evaluation as appropriate. However, the low flow TMDL prepared for critical conditions described in the TMDL Decision Rationale document is unlikely to be changed by the high flow TMDL. The low flow TMDL can be completed independent of the high flow TMDL as different critical conditions are employed. Assessment of nonpoint source loads during dry weather have been incorporated in the low flow TMDL through the assessment of background nonpoint source contributions.
05-E-07	The Step 1 model used by EPA is unrealistically conservative, resulting in point source discharge limits that are more stringent than necessary.	Doug Hanley	The TMDL model itself is not unrealistically conservative. It incorporates the best available science into the hydrodynamic and biochemical processes that describe the oxygen-carbon-nitrogen-phosphorus cycle.
05-E-08	If the Tier 2 TMDLs are implemented, as proposed, the cost to upgrade the Downingtown Treatment Plant will cost millions of dollars, which will place a substantial financial burden on the users of the Uwchlan Township sewer system. We believe that is unfair and inequitable since other discharges to the Christina River Basin, namely the non-point source discharges and the major point source discharges into the Delaware River, are not also required or probably will not be required to reduce their pollutant loadings into the Christina River basin.	Herbert J. May	Speculation on the costs for any planned improvements at facilities in the Christina River Basin as a result of the low flow TMDL are premature. Cost estimates for any required improvements will be evaluated during the implementation process.
06-F-01	We are in support of additional public participation in determination of the allocations.The affected dischargers should be given adequate time to evaluate the model and wasteload allocation scenarios before the TMDL is finalized.	J. Newbold	In response to requests received, EPA granted an additional 30 days to the public hearing record to allow more time for public review of and comment on the proposed TMDL.
06-F-02	The document title should be revised to say that this is the Step 1 TMDL for low-flow conditions, as reflected in the last sentence of the Introduction paragraph, the sentence beginning at the bottom of page 2 and the last paragraph on page 3.	J. Newbold	EPA will modify the TMDL Decision Rationale document title and appropriate text to clarify that this a TMDL for low-flow conditions.

TMDL ID #	Comment	Commenter	Response
06-F-03	A statement should be included in the document to say that implementation of the TMDL by the states (or of this first step of the two-step TMDL) can be deferred or postponed where appropriate until after completion of the second step, which will model and characterize high-flow conditions.	J. Newbold	EPA regulations at 40 CFR 122.44 (d) (1) (vii) (B) require that reissued permits must be consistent with any established TMDL. Once the low flow Christina River Basin TMDL is established, a reissued permit must be consistent with the loading requirements established by the TMDL. Inclusions of reopener clauses in reissued permits for possible future adjustments in the TMDL and a compliance schedule that offers a facility a period of time to meet the requirements of the TMDL within the period of the permit may be acceptable.
06-F-04	The document should clarify that where point sources on tributaries were involved in allocations, the allocations were actually determined at the confluence with the main stem stream segment, not at the point of effluent discharge to the tributary.	J. Newbold	The TMDL Decision Rationale document discusses the treatment of tributary discharges (allocations determined at the main stem) in the explanation of a conservative assumption used in the TMDL model (Section vii. 6.)
06-F-05	In the case of the West Chester-Taylor Run STP, we reviewed previous results from the Department model which was used in developing existing effluent limits to protect Taylor Run, our review indicated that the instream concentrations (14.5 mg/1 CBODS, 1.9 mgll NH3N) at the confluence with East Branch Brandywine Creek will be less than the draft allocation limits. Although our modeling didn't include phosphorus, available DMR data has shown that the discharge is consistently less than the existing permit limit of 2 mg/l. Using a log-normal distribution the 1997-1998 suggests an average monthly concentration of 1.9 mg/1 at the discharge point.	J. Newbold	See response to 06-F-06 below.

TMDL ID #	Comment	Commenter	Response
06-F-06	During our review it was also noted that the permitted annual average discharge flow is 1.5 mgd. This flow should be used for modeling purposes, instead of 1.8 mgd, which is the maximum monthly flow, to be consistent with flows used for other discharges. We recommend that EPA rerun the EFDC model using 1.5 mgd and conservative input values of CBODS=15 mg/l, NH3N=1.9 mgJl and P=1.9 mg/1 at the confluence to determine the impact on other discharges in the main stem East Branch Brandywine.	J. Newbold	An incorrect flow rate for the West Chester Taylor Run facility (PA0026018) was used in model runs reported in the draft TMDL Decision Rationale document. A monthly average flow rate of 1.8 mgd was used based on information from the 1995 Discharge Monitoring Report (DMR) data sheet provided by the Brandywine Valley Association. However, we understand that the permitted monthly average flow rate changed to 1.5 mgd in 1996. We have re-done the TMDL model allocation runs using the corrected flow rate of 1.5 mgd and revised allocations will be reported in the final TMDL Decision Rationale document. We also conducted a TMDL model run using a flow rate of 1.5 mgd as well as the lower parameter concentrations suggested in this comment (i.e., CBOD5=15 mg/L, NH3N=1.9 mg/L, and TP=1.9 mg/L). However, using the lower parameter concentrations did not impact the allocations in the East Branch Brandywine Creek. Therefore, we have decided to use the original concentrations (CBOD5=25 mg/L, NH3N=2.5 mg/L, and TP=2.0 mg/L) for the TMDL allocation runs in order to retain a consistent methodology with the other facilities in the study.
06-F-07	The implicit margin of safety assumption in the TMDL should not be affected by revisions due to West Chest-Taylor Run STP, a conservative assumption still exists because all other point sources are modeled using the theoretical situation of design flow and permit limits, all at Q7-10 stream flow.	J. Newbold	This comment is correct. The basic assumptions regarding implicit margin of safety still apply since we are only correcting an error in the flow rate at the West Chester Taylor Run facility.
07-G-01	The TMDL fails to account for: Leaf litter (soluble as well as SOD component),wetlands,lake turnover,& malfunctioning septic systems ... which are significant nutrient sources during fall low flow periods (background assumption and evaluation period error).	William Glover	Leaf litter, wetlands, lake turnover, and malfunctioning septic systems were not explicitly considered in the model. No information was available or provided on malfunctioning septic systems and the subject was never broached at any of the TMDL public meetings. The trend of increasing Total Organic Carbon concentrations in the main stem Brandywine Creek in the downstream direction may be due to the impacts of leaf litter.

TMDL ID #	Comment	Commenter	Response
07-G-02	The TMDL fails to account for: STPs perform better at low flow & below design loadings (TMDL calibration error).	William Glover	The use of maximum allowable permit (design) flows and loads has historically been the appropriate method for determining waste load allocations under steady-state conditions. Under dynamic conditions it is acceptable to determine waste load allocations using the statistical procedures outlined in the Technical Support Document for Water Quality-based Toxics Control, EPA605/2-90-001, 1991 (TSD). Since this low flow TMDL was determined for steady-state conditions, it is reasonable to use maximum allowable permit flows and loads. Dynamic conditions and variable flow will be considered under the high flow TMDL. See 01-A-03.
07-G-03	The TMDL fails to account for: Projected climate change will negate need to protect to high water quality standard.	William Glover	EPA is unaware of any agreed upon projected climate change that would negate the need to protect water quality standards.
07-G-04	The TMDL fails to account for: Where is there consideration for existing or new STP service area extensions which would reduce raw sewage discharge and septic system problem nutrient loadings? The cost to upgrade the STPs will discourage the connection of sewerage problem areas and contribute to the potential failure of this effort. Land use changes such as the elimination of forest areas or natural changes other than climate adjustments may negate this TMDL effort.	William Glover	The TDML is established based on existing maximum allowable permit limits for flow and loads, which in most cases, would allow for increases in flows to accommodate new connections by dischargers in the Basin. Speculation on the impacts of any costs to upgrade facilities in the Christina River Basin is unfounded until implementation plans are developed. This TMDL establishes limits under the design conditions which will continue to have to be met regardless of land use changes in the Christina River Basin.

TMDL ID #	Comment	Commenter	Response
08-H-01	I run the Broad Run wastewater treatment facility owned by Utilities, Inc. in Downingtown, Pa. I attended an informational meeting on July 18, 2000 and was informed of the new limits that would be imposed on this particular system for improved water quality for the Christina River Basin. At this meeting I raised concern that. the limit for Ammonia for this particular system would be 0.1 mg/l, This limit I feel is much too low and leaves no room for error. Both groups attending from EPA and DEP agreed that a 0.1 was rather low. They had used data that was from 1997 when for whatever reason my ammonia results were very good. A George Goliday was given ammonia data from 1996 through 1999 which gave a more accurate idea of how this system handled removal of ammonia. He said be would take this data and get back to me to see if these limits could be raised. I contacted George about the middle of September and he said they were looking at bringing these limits up to maybe 0.4mg/1 to 0. 5mg/1. I told him that I was still uncertain that my system would be able to meet these limits and asked if there was any way that they could be put at 2.O mg/l. He said he would send the info to others and see if it could be done in conjunction with the lowering of other parameters. He also said that he would be leaving and said that a person to talk to would be Mike Morten. I now would like to submit that I would be much more comfortable if ny ammonia limit was placed at 2.Omg/1. When we first took over this system in August 1992 the DEP permit for ammonia was monitor only. Because (I guess) that my ammonia was low the new DEP permit issued in Jan. 1999 removed the ammonia limit completely. Now all of a sudden because of the Christina River Basin EPA comes along and wants to put my ammonia limit at 0. 1mg/l.	J.Hawkes, Jr	The TMDL analysis was revised to reflect new ammonia nitrogen limits of 2.0 mg/L for the Broad Run Sewer District WWTP (PA0043982). The TMDL allocation results presented in Table 11 of the TMDL Decision Rationale document reflect the revised ammonia nitrogen limit of 2.0 mg/L.
09-I-01	A "Total Maximum Daily Load" is a process, many years delayed and now being carried out under a deadline resulting from litigation, to determine how the Christina is impacted by pollutants, and what reductions in those pollutants would be needed to achieve some degree of compliance with the (very weak and inadequate) water quality standards adopted by Delaware and Pennsylvania under authority delegated by the EPA under the Clean Water Act.	Muller& Collins	EPA does not agree with the description of the Pennsylvania and Delaware water quality standards, approved by EPA, described in this comment. The standards established by the states, and the DRBC, provide the basis for the TMDL process and are subject to their own, separate public review procedures. EPA has no basis to question the standards employed in the development of the Christina River Basin TMDL.

TMDL ID #	Comment	Commenter	Response
09-I-02	The proposed TMDL apparently applies only to "point" sources, calls for only small reductions, does not contain explicit safety factors, and assigns all the reductions to Pennsylvania and Maryland, although everyone in Delaware knows that water quality in the Christina is severely impacted by discharges in and near the City of Wilmington. This is absurd, and likely to lead to a situation in which Pennsylvania officials are understandably reluctant to make reductions.	Muller& Collins	The basis for this TMDL is a point source evaluation under design low flow conditions. Impacts of other sources in the Christina River Basin will be evaluated through the high flow TMDL. The TMDL model runs used in the development of the TMDL pinpointed the dischargers where reductions are necessary.
09-I-03	At the "public meeting" the presenter was unable to say how the recent 50% permitted increase from the City of Wilmington POTW was treated in the model. Thus, we doubt the model in this and other respects reflects reality.	Muller& Collins	After presentation of this statement at the Wilmington public information meeting on July 19, 2000, EPA asked its Christina River Basin TMDL model consultant to evaluate the impacts of the revised Wilmington STP permit. This analysis was performed and the conclusion reached that the revised permit had no impacts on the Christina River Basin TMDL.
09-I-04	There appears to have been no meaningful public participation in the development of the TMDL. Rather, cosmetic, public-relations-oriented activities were set up to distract members of the public from participation in the actual formulation and calibration of the model. We object very strongly to this bogus form of public participation, and the management of it by Mr. Robert Struble, who represents organizations now or formerly under the influence of major dischargers and environmental offenders such as NVF Corp. As shown by material released under a Freedom of Information Act request, Mr. Struble has been meeting with "dischargers"and apparently helping them to coordinate objections to reductions. On the other hand, Struble asked to be taken off Green Delaware's mailing list, and took us off his mailing list for his dubious activities. To have hired Mr. Struble, with all his potential conflicts of interests, mocks the most basic concepts of good faith, and has contaminated the integrity of the entire process. What should have been done includes this: Those involved in the technicalities of model development should have identified the judgement calls and assumptions they were considering, and sought public input on same.	Muller& Collins	EPA disagrees with the characterization of the public participation process for the Christina River Basin TMDL as described in this comment. As discussed in the Decision Rationale document, EPA, with the assistance of several participating agencies, conducted an open process throughout the development of the Christina River Basin TMDL. Numerous public meetings were scheduled and the public meeting process culminated in the general information meetings on July 19 and 20. EPA also developed and publicized an internet web site (www.epa.gov/reg3wapd/christina) where many documents relevant to the Christina River Basin TMDL were made available and opportunity provided for submission of comments. In addition, EPA has no basis to object to the involvement of Mr. Robert Struble in the public participation efforts pertaining to the Christina River Basin TMDL. Mr. Struble provided assistance in arranging very productive sessions with representatives of many Christina River Basin dischargers and acted in a neutral manner in conveying an objective summation of the concerns of these dischargers.

TMDL ID #	Comment	Commenter	Response
09-I-05	Recognizing that hydrodynamic and water quality modeling of a river basin is a complex process, we are concerned that the complexity of the process, in and of itself, tends to obscure the reality of a polluted waterway that will remain polluted. To put it another way, the EPA seems to have long since lost touch with the original intent and purpose of the Clean Water Act.	Muller& Collins	EPA acknowledges that establishment of a TMDL is a complex and highly technical process, especially when done in an interstate watershed such as the Christina River Basin . However, establishment of TMDLs is a core element of the Clean Water Act, being a statutory requirement since 1972. The establishment of TMDLs is clearly part of the intent and purpose of the Clean Water Act.
09-I-06	We received a strong impression, from both the "public meeting," and the "public hearing," that EPA was unlikely to pay serious attention to comments received from the public on this matter. Certainly DNREC has neither sought not considered public opinion on this project.	Muller& Collins	EPA disagrees with this comment. During the public meetings and hearings, EPA made it clear that it welcomed comment on the proposed TMDL and would revise the TMDL as necessary based on comments received. In fact, numerous changes were made in the proposed TMDL between the public meetings and public hearings based on information received at the public meetings. Additional changes have been made to the TMDL in response to comments received following the public hearings. The role of the Delaware Department of Natural Resources and Environmental Control (DNREC) in the public participation process was that of a supporting agency as initially the DRBC Commission and then EPA were responsible for the administrative portions of the TMDL development. DNREC has provided considerable support to both the DRBC and EPA in the development of the TMDL and attended nearly all the public meetings and hearings and provided comments and responses to questions as necessary.
09-I-07	In conclusion, we recommend that the proposed TMDL not be adopted at this time. We conclude that neither DNREC nor EPA have complied with the settlement agreements under which this work went forward, nor would the work product, as it now stands, reasonably lead to compliance with the Clean Water Act.	Muller& Collins	EPA respectfully disagrees on both points. In establishing the Christina River Basin TMDL, EPA and DNREC are also complying with settlement agreement reached in response to the Delaware 303(d) lawsuit. EPA also asserts that the establishment of this low flow TMDL is an important milestone for compliance with the Clean Water Act in the Christina River Basin.

TMDL ID #	Comment	Commenter	Response
10-J-01	Model Results Confirm that Discharges to the East Branch of Brandywine Creek do not Adversely Affect the Christina River, therefore no TMDL is necessary. The problem identification section of the TMDL identified the tidal Christina River as the region experiencing water quality problems due to nutrient loading, while other tributaries (such as the East Branch of Brandywine Creek) are not impaired (@ pg. 11). This assessment is supported by the 1997 calibration evaluation illustrated in Figures 6 and 7 of the report for average and minimum dissolved oxygen levels. However, the TMDL evaluation, under design conditions, demonstrates that no water quality excursions are expected in the tidal portions of Brandywine Creek at the confluence with the Christina River (Figures 8 and 9 of the report). This result is a clear indication that point source nutrient loads to the East Branch are not responsible for water quality excursions in the tidal Christina River. Thus, EPA has demonstrated that regulation of upstream sources is not required under this TMDL action.	William Hall	Refer to Figure 8 and Figure 9 in the TMDL Decision Rationale document. These figures present model results indicating the locations where the water quality standards for daily average DO (Figure 8) and the minimum DO (Figure 9) are not protected during critical summer low-flow conditions with NPDES sources discharging at their existing monthly average permit limits. These two figures indicate that a large portion of the East Branch Brandywine Creek are indeed adversely affected by nutrient loads under assumed critical conditions. In Figures 6 and 7, TMDL model results are presented showing the locations were water quality standards for daily average DO and minimum DO are not protected during the August 1997 calibration period. The TMDL model indicates the daily average DO in a portion of the tidal Christina River does not meet the water quality criteria of 5.5 mg/L. A smaller portion of the Christina River does not meet water quality standards under the critical conditions TMDL model run (Figure 8). This is somewhat misleading because a point source in Little Mill Creek was active for the 1997 calibration period, but is no longer active today and was not included in the critical conditions model run (Figure 8). The loads from that point source were influencing the tidal Christina River in the vicinity of the mouth of Little Mill Creek during the calibration runs but not during the critical conditions run.

TMDL ID #	Comment	Commenter	Response
10-J-02	Figures 8 and 9 suggest that water quality problems will occur in the East Branch of Brandywine Creek under design conditions. However, this is not the basis for the TMDL, and PADEP has not identified these reaches as not attaining water quality standards. These sources are currently regulated under water quality-based permits that PADEP considers sufficient to attain all applicable water quality objectives. A probable reason for this difference in opinion is that the TMDL critical conditions combine multiple worst-case assumptions that represent a highly improbable condition with a remote probability of occurrence. PADEP, not EPA, has delegated authority on such decisions. If EPA believes that additional restrictions may be necessary, it may raise such issues at NPDES reissuance. EPA does not have any jurisdiction to impose a more restrictive water quality-based limit at this time.	William Hall	EPA has the authority to establish waste load allocations, as called for in the TMDL regulations and consistent with agreements reached with affected state and other parties. NPDES permits and associated limits are not automatically changed with the establishment of a TMDL. Any changes to NPDES permits will afford additional opportunities for comment and review. Any NPDES permits reissued after the establishment of such TMDL waste load allocations must contain effluent limits 'consistent with' the applicable waste load allocation (40 CFR 122.44 (d) (1) (vii) (B)).
10-J-03	TMDL Model Uses Wrong Effluent Flows from POTWs. The critical condition analysis used by EPA in the TMDL was based on drought flow conditions in the Christina River Basin with point source discharges at their design flow rates. Specifically, the discharge for the Authority's wastewater treatment facility, the Downingtown Regional Water Pollution Control Center ("DRWPCC") was set at the facility design flow rate of 7.0 mgd (see Table 14 of report) while the East Branch flow was approximately 19 cfs. EPA did not present any information regarding the type of condition represented by the plant design flow (e.g., wet, dry, average, etc.). The report defines this critical condition analysis as representative of steady-state conditions expected to occur through the month of August (@ pg. 23). However, the relevant performance data confirm that use of the design flow is not representative of conditions expected to occur in August, or any other month when drought conditions exist in the Christina River Basin.	William Hall	The maximum allowable monthly average permit flows and loads for the NPDES facilities were used for the TMDL model runs. There are no provisions in the NPDES permits requiring that these facilities are to discharge less mass loading during low-flow conditions. Therefore, it is appropriate for EPA to use the maximum allowable permitted flows in developing the TMDL since they represent the allowable loading from the facility under any stream flow condition. Such assumptions are reasonable and appropriate to ensure a TMDL that will attain and maintain water quality standards. See 01-A-03 and 10-J-05.

TMDL ID #	Comment	Commenter	Response
10-J-04	DMR data for the DRWPCC between 1997 and 2000 indicate that the monthly average flows ranged from 3.97 mgd to 4.63 mgd for the month of August, with an average August flow of 4.25 mgd. The highest monthly average flow (4.63 mgd) occurred in the year 2000, which was a year with higher than average rainfall. The lowest monthly average flow, 3.97 mgd, occurred in 1999 (a period experiencing drought conditions). These data clearly indicate that the design flow, 7.0 mgd, is not appropriate for modeling steady-state conditions in August. The design flow used for characterizing stream impacts does not reflect low flow conditions. The fact that EPA used the design flow when such a flow is inconsistent with the other modeling conditions violates the Agency's own policy and practice in this matter (see letter from James F. Pendergast to Gary Stenhouse, September 20, 1996, Attachment 1 hereto). The model should have incorporated the effluent flows anticipated in August for drought conditions along with the loads corresponding to these flows.	William Hall	The purpose of the TMDL was to determine the allowable loading from all sources to the impacted stream segments. The existing maximum allowable permit limits were used as a base condition to determine the existing allowable loading from the NPDES facilities. EPA has no policy on this issue. Mr. Pendergast's response to the questions posed him from Mr. Stenhouse does not refer to policy or regulations that require the use of seasonal flows or conditions. Mr. Pendergast uses terms such as "no requirement in the Clean Water Act...", "EPA encourages permitting authorities...", "an alternative is steady-state modeling.", "states may require...", and "the Clean Water Act and EPA regulations do not specify an effluent flow that must be used...". Mr. Pendergast notes that EPA 'encourages' states to use a dynamic model. EPA does not require it. Mr. Pendergast also notes that steady state modeling is an acceptable alternative to dynamic modeling if a state chooses not to model dynamically. Mr. Pendergast's response states that tiered permits are acceptable under the CWA and implementing regulations, but he does not say that they are mandatory under any circumstances. What Mr. Pendergast's response does refer to is the need to meet state water quality standards. Pennsylvania's standards apply to the 7Q10 low flow and above. Therefore it is imperative to assure that any allocation that is developed will meet these conditions. Please note that the process used to develop low flow TMDLs for the Christina River Basin study is no different than the process used by Pennsylvania statewide for developing permit condition, the use of low flow critical conditions at effluent design flow conditions. The only difference is that the TMDL was based on more detailed environmental data and detailed modeling and also overlapping impacts of various dischargers were necessary. We suspect that Downingtown's existing permit conditions were developed no differently but with less stream data and a less sophisticated model. Another point is that Downingtown does not now have seasonal effluent limits for flow. Under the NPDES permit now held by Downingtown, the maximum flow can legally be 7 MGD at any time of the year. We have developed this TMDL based on the legal limitations for flow and other environmental conditions. Downingtown has the option of pursuing the option of

		seasonal flows with the state as the facility's permit is renewed.

TMDL ID #	Comment	Commenter	Response
10-J-05	TMDL Based on Overestimated Loads from POTWs Loads used in the steady-state analysis were based on the design flow and the permitted effluent concentration. For the DRWPCC, these permit limits are 10 mg/1 (CBOD5), and 2.0 mg/1 (ammonia nitrogen and phosphorus). As indicated above, use of the design flow to set wasteloads is inappropriate for modeling purposes. In addition, use of the permit limit concentrations is inconsistent with limit derivation processes and actual performance. For a facility to be in compliance with its permit, typical performance must be significantly better than the permit limit. The Agency considers the permit level to represent (at the minimum) the 95th percentile concentration within the frequency distribution of a POTW's performance. The steady-state modeling results, if otherwise computed properly, should represent average loads under drought conditions. The modeling results could then be used to project effluent limits as values greater than the average loads, using the statistical procedures contained in the Technical Support Document for Water Quality-based Toxics Control ("TSD"); EPA, 1991). The TMDL study, however, did not treat the results as average loads under critical conditions. The results were treated as though the permit limits should be set at the reduced levels. This approach is overly conservative because it presumes that every discharger will discharge at the 95th percentile concentration, simultaneously. This scenario has a very low probability and should not serve as the basis for a scientifically justified study. The performance expected under warm weather, low flow conditions should be much better than the permit limit. A review of Downingtown's performance over the past four years confirms this situation. Downingtown Area Regional Authority Summary of August Performance Data (mg/1) Year BOD5 Ammonia Phosphorus 1997 2.4 0.1 1.4 1998 3.0 0.1 1.3 1999 2.0 0.1 1.4	William Hall	The use of maximum allowable permit (design) flows and loads has historically been the appropriate method for determining waste load allocations under steady-state conditions. Consistent with EPA guidance, under dynamic conditions it is acceptable to determine waste load allocations using the statistical procedures outlined in the Technical Support Document for Water Quality-based Toxics Control, EPA605/2-90-001, 1991 (TSD). Since this low flow TMDL was determined for steady-state conditions, it is reasonable to use maximum allowable permit flows and loads. Dynamic conditions and variable flow will be considered under the high flow TMDL.

TMDL ID #	Comment	Commenter	Response
	2000 2.0 0.1 1.5 The August performance data are representative of expected facility performance throughout the summer and for most of the year. By comparison, the TMDL model used loading rates that were factors of: five higher for BODS; 35 higher for ammonia; and two higher for phosphorus. It is no wonder that the model predicted water quality problems in the East Branch of Brandywine Creek. The actual loads from Downingtown were less than the TMDL Level 2 Allocations for CBODS and ammonia-nitrogen presented in Table 11 (@ pg. 47), confirming that the discharge does not, in any way, cause water quality impairment.		
10-J-06	Actual Data Confirm that No Problem Exists in the East Branch of Brandywine Creek. The critical condition analysis for this TMDL concluded that daily average DO criteria and minimum DO criteria will not be achieved in portions of the East Branch Brandywine Creek below Downingtown (@ pg. 23). In contrast to this finding, the draft TMDL report noted that no DO criteria violations occurred in the East Branch of Brandywine Creek for the period from 1988 through the present. This lack of DO criteria violations was attributed to improved wastewater treatment effective in 1988 and served as the basis for not listing the East Branch Brandywine on the 303(d) list. Given this long history of meeting water quality standards for DO, it is inappropriate for the Agency to predict extensive areas of non-compliance by exaggerating the loads that actually reach the receiving waters.	William Hall	The TMDL has been developed for critical conditions expected during times of low flow. The critical conditions analysis is in accordance with standard practices employed in establishing permit limitations. The TMDL model runs for the Downingtown facility clearly indicate DO impacts under these critical conditions. It is likely that the period of time referenced when the East Branch Brandywine Creek did not evidence DO violations did not provide any comparable occurrence of the design conditions used to develop the TMDL. Note: the East Branch Brandywine Creek is on Pennsylvania's 303(d) list as a result of siltation, flow alterations and other habitat alterations. Modeling work performed in development of a TMDL is a valid basis for a 303(d) listing (40 CFR 130.7 (b) (5) (ii).

TMDL ID #	Comment	Commenter	Response
10-J-07	Nutrient Reduction Not Supported by Data for the East Branch of Brandywine Creek. The Level 2 Allocations for the DRWPCC (@ pg. 47) specify an allocation limit of 5.90 mg/1 for CBOD5, 1.18 mg/1 for ammonia-nitrogen, and 0.73 mg/1 for total phosphorus when the Christina River Basin is experiencing drought flow conditions and the discharge is at the design rate of 7.0 mgd. Historical performance for August indicates that the facility flow rate is approximately 4.25 mgd, and effluent quality is better than the allocation limits for CBOD5 and ammonia-nitrogen. Given the high effluent quality of the discharge, there is no reason to believe that reductions in phosphorus beyond the current limit of 2.0 mg/1 are required to achieve DO standards in the East Branch. Based on this more detailed review outlined above, and the comments previously submitted by DARA, we believe that the allocations specified for loads to the East Branch of Brandywine Creek are unjustified. With specific reference to the DRWPCC, no adjustments to the permit limits for BOD5, ammonia-nitrogen, or total phosphorus are justified.	William Hall	There is no provision in the NPDES permit for the Downingtown facility requiring that phosphorus discharge concentrations are to be less than 2.0 mg/L during low-flow conditions. Therefore, it was appropriate for EPA to consider the maximum allowable permit limit concentrations for developing the waste load allocation portion of the TMDL. The Level 1 and Level 2 allocation results of the TMDL model indicate there is reasonable justification for reducing the CBOD, ammonia nitrogen, and phosphorus concentrations from the Downingtown facility in order to protect the dissolved oxygen water quality standards in East Branch Brandywine Creek and downstream waters.
11-L-01	The point source "TMDLs" are based on average monthly discharge limits, and are therefore more accurately called "Total Monthly Average Loads," not "Total Maximum Daily Loads."	J.R.May	Point sources have been evaluated using existing NPDES effluent limitations and associated water quality data. Limits contained in the permits, and in the proposed point source reductions, provide an accurate estimate of the expected daily load from each discharger based on a monthly average. The resulting summation of the point source loads do in fact comprise the daily waste load component of a TMDL. Please refer to Table 8 in the Decision Rationale document.

TMDL ID #	Comment	Commenter	Response
11-L-02	In addition, because the allocated loads do not account for maximum permit conditions, the TMDLs will not protect the stream from further violations of the minimum Dissolved Oxygen water quality standard.	J.R.May	Because the TMDL sets waste load allocations assuming maximum allowable discharge of pollutants, the TMDL is protective of applicable DO water quality standards. The existing permit limits, and the proposed reductions in effluent limits for selected facilities as represented in the waste load allocations, are shown by TMDL model runs to be sufficiently protective to prevent violations of the minimum DO water quality standard. Data plots showing the protection of the minimum DO water quality standard will be added to the Decision Rationale document as an Appendix.
11-L-03	While reductions from the 12 point sources may result in improved water quality on those three water bodies, and on waters downstream, it cannot possibly improve water quality on the remaining impaired waters on the Pennsylvania and Delaware 303 (d) lists (see Table 3 and Table 4 in the TMDL document). No explanation is provided for how reductions in only these 12 point sources will address the impaired water quality of these "upstream" water bodies.	J.R.May	This TMDL is for low-flow critical conditions. Data plots for the TMDL allocation run show that DO water quality standards throughout the Basin, including 'upstream' water bodies, will be protected as a result of reductions specified in this TMDL for the low-flow critical condition. This information will be added to the Decision Rationale document as an Appendix.
11-L-04	In addition, many streams on the 303(d) lists list only nonpoint sources such as agriculture as the source of impairment; unbelievably, the proposed TMDL requires no reductions from current nonpoint source loads. (See Table B below.)	J.R.May	This TMDL is for low-flow conditions. Nonpoint source loads assessed as background conditions are incorporated in the low-flow TMDL. A full evaluation of nonpoint source loads under high flow conditions will be made in the high flow TMDL.
11-L-05	The failure to address nonpoint source loading in the TMDL automatically renders the TMDL inadequate to address water quality problems in a significant portion of the Christina River Basin. In addition, the failure of the model to predict impairment in these stream segments demonstrates the inadequacy of the model used to develop the TMDL.	J.R.May	This TMDL is developed to address low-flow conditions outlined in the Decision Rationale document and the waste load and load allocations have been prepared to protect DO standards in the Christina River Basin under those design conditions. See 01-A-03 and 11-L-10.

TMDL ID #	Comment	Commenter	Response
11-L-06	The commentors also note that the model fails to predict impairment from low DO for the Red Clay Creek, East Branch Red Clay Creek, East Branch White Clay Creek, Buck Run, and Little Mill Creek, even though these streams are specifically listed as impaired from this cause on the PA and DE 303(d) lists.	J.R.May	The Red Clay Creek, East Branch Red Clay Creek, East Branch White Clay Creek and Little Mill Creek segments do not identify point sources as a basis for the 303(d) listing decisions. Buck Run did identify point sources as a basis. However, a review of dischargers on Buck Run shows that the largest discharger to Buck Run, Parkesburg Borough Authority WWTP, ceased discharge to Buck Run in June 1997. Two other small dischargers to Buck Run were evaluated and the results did not indicate any DO violations.
11-L-07	Also puzzling is the fact that point sources listed as the source of impairment for Buck Run, Middle Branch White Clay Creek, and mainstem White Clay Creek (DE) are not reduced by the TMDL.	J.R.May	Point sources were identified in the 303(d) listing for Buck Run. However, a review of dischargers on Buck Run shows that the largest discharger to Buck Run, Parkesburg Borough Authority WWTP, ceased discharge to Buck Run in June 1997. Two other small dischargers to Buck Run were evaluated and the results did not indicate any DO violations. Dischargers to the Middle Branch White Clay Creek and main stem White Clay Creek (DE) were evaluated and the results did not indicate any DO violations.
11-L-08	During critical, lowflow conditions, the amount the water body can absorb is affected significantly by the amount of nutrients already present in the water body because of loading during storms or high flow periods. Therefore, the model used to calculate the low-flow TMDL must account for nonpoint source loads from storm events or high flows in order to produce an adequate TMDL during low-flow	J.R.May	The amount of nutrients present in the waterbody would be accounted for as background contributions. EPA utilized data from STORET, USGS, DEP, and DNREC to characterize background pollutant contributions. In addition, baseflow samples from USGS are used to characterize the nature of pollutant loadings from baseflow. EPA believes that the model adequately considers pollutant contributions from nonpoint sources. See 11-L-10.

TMDL ID #	Comment	Commenter	Response
11-L-09	To reasonably assure that water quality standards will be met during low-flow conditions, the low-flow TMDL must set maximum daily loads of nutrients from both point sources and nonpoint sources.	J.R.May	Table 8 of the Decision Rationale document sets forth waste load allocations for point sources and load allocations for nonpoint sources broken down by watershed for the Christina River Basin. Tables 12-27 specify individual waste load allocations for point sources in specific subwatersheds as well as load allocations for nonpoint sources broken down into 39 subwatersheds. These load allocations specify the maximum pollutant loads for carbonaceous biochemical oxygen demand (measured during a 5-day period), ammonia nitrogen, and total phosphorus for all 122 point source dischargers and the 39 subwatersheds in the basin. The Decision Rationale document specifically states why EPA believes that the Christina River Basin TMDL meets the requirements for TMDLs.

TMDL ID #	Comment	Commenter	Response
11-L-10	If nonpoint source loads from storm events or higher flow periods are not adequately accounted for in the model (and the commentors contend that the model does not adequately account for NPS loads or nutrients in stream sediment), the TMDLs assigned to point sources during low flow will be too high to achieve water quality standards.' If further reductions in nutrient pollution from point sources become impractical during low-flow, or if no point sources are present on an impaired stream segment, then measures to reduce nonpoint source loading during storm events and higher flow periods must be implemented to achieve water quality standards during low-flow.	J.R.May	Nonpoint source loads are adequately accounted for in the Christina River Basin TMDL model. EPA utilized existing data from STORET, United States Geological Survey (USGS), Pennsylvania Department of Environmental Protection (DEP) and DNREC to develop characteristic nonpoint source loads for parameters of concern from each of the 39 subwatersheds during critical low-flow conditions. These characteristic loads are used by the model during development of the allocation scenarios to represent nonpoint source pollutant contributions. Furthermore, those characteristic loads are representative of baseflow contributions (considered the dominant nonpoint source during critical low flow conditions) as well as expected land-based, nonpoint source during critical low-flow conditions. The Christina River Basin model also accounts for potential sediment effects on DO through the use of the Sediment Oxygen Demand (SOD) variable. SOD is accounted for during the TMDL analysis and allocation scenarios and is based on literature values as well as site-specific SOD data gathered by DNREC. Critical conditions in the Christina River Basin, as indicated by data characterization performed by Dr. John Davis (Preliminary Draft TMDL Document 5/27/99 - Report to DRBC) and confirmed through modeling, occur during relatively dry late summer and early fall months when streamflow is reduced and temperatures are high. During these times, the assimilative capacity of waterbodies are at a minimum. Point sources are the dominant contributor of pollutant loadings during these critical conditions. Land-based nonpoint sources, on the other hand, contribute very little loading during the late summer and early fall drought periods. However, contributions from nonpoint sources are reflected in the data used to develop characteristic nonpoint source loads during critical conditions. As discussed in the Decision Rationale document, an implicit margin of safety was provided in the TMDL through the use of conservative assumptions in the TMDL model.

TMDL ID #	Comment	Commenter	Response
11-L-11	In Section 1.1 of the model report, the scope of the Phase I model is narrowly focused on those stream segments impaired by point sources only: "The stream segments shown in [figure identifying segments impaired by point source only] will be the primary focus of this initial phase of the TMDL for low-flow conditions." This narrow focus leaves out the entire Christina River, the East and West Branches of the Brandywine Creek, the East and West Branches of the Red Clay Creek, and the East Branch of the White Clay Creek-in other words, most of the Christina River Basin.	J.R.May	Consistent with the Watershed Protection Approach advocated by EPA, the Christina River Basin TMDL addresses those segments indicated as impaired on both Pennsylvania and Delaware's 1998 303(d) lists as well as waterbodies which are not listed. While it is true that a significant amount of effort was focused on those segments impaired by point sources, the Christina River Basin TMDL does not focus exclusively on those segments. All waterbody segments in the basin are represented within the model and considered during the TMDL analysis. Tables 12 through 27 in the TMDL Decision Rationale document contain summary waste load and load allocations for all of the segments mentioned in this comment.
11-L-12	T. H. Cahill, P.E., confirms this basic flaw in the TMDL as proposed: "A major portion of the nutrient and organic loadings experienced into this watershed occurs during wet weather periods, when transport from the watershed land surface can increase nutrient concentrations by two orders of magnitude. This flux of nutrients through the drainage system, which occurs on only some 30 days in an average year, comprises a significant part of the accumulated benthic food supply. In effect, any type of Mass Load Analysis that wishes to determine (and hopefully reduce) the root cause of water quality impacts must consider the wet weather input as well as the daily residual produced from multiple sewage treatment plants in the drainage ....Even though the most severe water quality conditions are experienced during the drought periods, the source(s) of these problems are generated throughout the full hydrologic cycle. Only a model that considers the total water balance (and chemical balance) can produce guidance on the potential benefit of both point and nonpoint reduction strategies."	J.R.May	Nonpoint sources were adequately considered in this TMDL through development of characteristic nonpoint source loads during critical conditions. The data used to characterize nonpoint source loads and background contributions acts to integrate the impacts of past loading events into the TMDL calculations. During low-flow conditions, nutrient laden sediments would release nutrients into the overlying water column. Samples gathered during these conditions would reflect levels of nutrients present in the waterbody which would include contributions from nutrient laden sediments as well as other nonpoint sources. Impacts of precipitation events on nutrients will be considered in the high flow TMDL. See 11-L-10.

TMDL ID #	Comment	Commenter	Response
11-L-13	In addition, as discussed previously in these comments, these load allocations only account for loads actually flowing into the waters during low-flow, not for nutrients that have entered the stream during storm events or high-flow periods and remain in the sediment and in downstream waters during low-flow periods. The best the EPA does in the TMDL is say that it is "likely" that the background data collected during critical conditions accounts for the loading during storm events. It provides no support for this statement and fails to explain what "likely" means.	J.R.May	As previously stated, EPA believes the Christina River Basin TMDL adequately considers nonpoint source pollutant contributions during low flow. The TMDL considers specific pollutant loads from baseflow contributions, atmospheric deposition, natural background contributions, as well as land-based contributions. Background data is likely to incorporate past loading events based on the following argument: 1) following deposition of sediment from a storm event, nutrients may begin to move from the sediments into the overlying water column; and 2) once in the water column, sampling would capture that portion of nutrient contributions from the sediment and it would be reflected in the sample value for the parameter of concern. See 11-L-10, 11-L-31 and 11-L-32.
11-L-14	The TMDL misconstrues the term "seasonality" to allow it to defer considerations of nonpoint source pollution improperly to the Stage II TMDL.	J.R.May	Seasonality refers to the need to consider how changes in hydrologic and climatological patterns may affect the TMDL. Within the context of the critical condition of low flow that EPA identified as the appropriate flow regime for this TMDL, EPA considered how warmer conditions and reduced flow typical of late summer and early fall drought periods would impact TMDL development and allocation scenarios. EPA appropriately considers seasonality by incorporating these seasonal variations into the TMDL analysis and allocation scenarios. Nonpoint source loads are considered by incorporating characteristic pollutant contributions in the TMDL developed from available data gathered during these critical conditions. Those characteristic loads, which represent pollutant contributions from baseflow, background, and land-based sources, are subsequently used in the TMDL analysis and allocation scenarios.
11-L-15	However, deferral of the TMDL for high-flow periods to Stage II does not allow EPA to ignore or diminish the effects of nonpoint source pollution on water quality during the critical condition period that is the subject of the Phase I TMDL. Because storm events occur during the low-flow "season," and nutrients accumulated in the sediment during higher flow "seasons" continue to affect water quality during low-flow, the lowflow TMDL must account for the effects of these storm events and sediment deposits on water quality.	J.R.May	As stated in the response to 11-L-10, EPA does adequately account for nonpoint source loads during critical conditions. See also 11-L-31 and 11-L-32.

TMDL ID #	Comment	Commenter	Response
11-L-16	Until high flow scenarios and NPS load estimates are refined through the HSPF model, . modelers must estimate NPS load from the best available information. In addition, the EPA must incorporate a substantial margin of safety into the final TMDL.	J.R.May	EPA has utilized best available information to assess the nonpoint source load as discussed in 11-L-10. As discussed in the Decision Rationale document, an implicit margin of safety was provided in the TMDL through the use of conservative assumptions in the model.
11-L-17	The TMDL endpoints-daily average and minimum DO values selected to quantify stream impairment during modeling (Table 7 in TMDL document) are appropriate for only those stream segments with designated uses of Fresh Waters (DE), Warm Water Fish (WWF), Marine Waters (DE), and Trout Stocking Fishery Aug 1-Feb 14 (PA). These endpoints do not satisfy water quality standards for stream segments with designated uses of Cold Water Fish (PA, DE)', Trout Stocking Fishery Feb 15-Jul 31 (PA), and High Quality Trout Stocking Fishery (PA). Several stream segments in the Christina River Basin must meet these higher standards for DO concentration. (See Figure 10 in TMDL document.)	J.R.May	Data plots for the TMDL allocation run shows that the higher DO standards for these identified segments will be protected during the critical conditions evaluated during the development of this TMDL. This clarification will be added to the TMDL Decision Rationale document as an Appendix.
11-L-18	Because it used the less stringent standards as the basis for the TMDL model, the EPA cnnot assert that the resulting TMDL will protect those stream segments with more stringent water quality requirements.	J.R.May	Data plots for the TMDL allocation run shows that the higher DO standards for these identified segments will be protected during the critical conditions evaluated during the development of this TMDL. The TMDL is protective of applicable DO standards in the Christina River Basin. See 11-L-17.
11-L-19	Pennsylvania has also designated at least one stream segment in the Basin (East Branch White Clay Creek) as Exceptional Value waters. The TMDL makes no mention of this designation or its implications for water quality management in the Basin.	J.R.May	The TMDL Decision Rationale document will be revised to take note of this designation. The results of the TMDL model runs indicates that the DO standards for the East Branch White Clay Creek will be maintailned and protected consistent with antidegradation requirements. The Exceptional Value waters designation will provide additional protection of water quality conditions through the regulatory provisions of the Pennsylvania antidegradation program (25 PA Code Chapter 93.4(c)) and 40 CFR 131.32.

TMDL ID #	Comment	Commenter	Response
11-L-20	This guidance is consistent with EPA's long-standing recommendation for allowable phosphorus in flowing waters. Nevertheless, WLAs for total phosphorus in the Draft TMDL will cause these widely accepted phosphorus criteria to be exceeded by wide margins throughout the Christina River basin. Mass balance calculations demonstrate that low flow phosphorus concentrations resulting from the Draft phosphorus WLAs will be 0.3 to 0.4 mg/1 in Brandywine Creek, 0.3 to 0.5 mg/1 in main stem White Clay Creek, and 0.8 to 1.0 mg/1 in main stem Red Clay Creek and Christina River West Branch.	J.R.May	The identified value for phosphorous cited in the comment is not an applicable water quality criterion by any regulatory agency in the Christina River Basin, simply a guidance value. As discussed in the Decision Rationale document, controls on the discharge of phosphorous is part of an overall strategy to achieve attainment of applicable DO water quality standards. The guidance value has utility when site-specific data are not available. In this TMDL, data were available upstream and downstream of major dischargers, which indicates that phosphorous levels less than 0.1 mg/l are not necessary to ensure attainment of DO criteria during critical low-flow conditions.
11-L-21	The TMDL fails to account for or address the pH criteria violations that continue to occur in the Brandywine Creek despite lower levels of phosphorous as compared to the 1980s. (See data). The TMDL simply ignores the pH criteria violations and fails to provide any assurance that the reductions in point source loads will end these water quality violations.	J.R.May	Water Quality Standards for DO, not pH, are appropriately used as the water quality target of this TMDL. EPA believes that the pH criteria violations are directly coupled with photosynthesis and respiration which occurs in the stream in response to excess nutrient loading. EPA further believes that controls on nutrients as established in this TMDL will address the pH violations.
11-L-22	Also significant is the concurrent increase in nitrate-nitrogen concentrations in the past decade, though no analysis of the relationships is provided in the document.	J.R.May	Nitrate-nitrogen values were assessed in the data plots for the TMDL allocation run. The only instances where the 10 mg/l value is exceeded are small distances on the East Branch Brandywine Creek and West Branch Brandywine Creek. As there are no drinking water withdrawals at these locations, additional reduction is not necessary to meet the standard. This information will be added to the TMDL Decision Rationale document.
11-L-23	Insufficient attention is paid to whether phosphorus or nitrogen is the limiting nutrient in each stream segment of the Christina River basin	J.R.May	In Section 9.6 of the Model Report, it is noted that there was an abundance of nitrogen available and that phosphorous is the more limiting of the two nutrients based on data at five locations. The five locations were in West Branch Brandywine Creek, East Branch Brandywine Creek, Brandywine Creek (at Chadds Ford), Christina River and West Branch Red Clay Creek. Time-series plots at each location are found in Figures 9-12 through 9-16 in the Model Report. The information presented in the TMDL Decision Rationale document on this subject will be expanded.

TMDL ID #	Comment	Commenter	Response
11-L-24	Nonpoint sources are cited as the only source of impairment for several of the streams listed on the PA and DE 303(d) lists, and are cited as a primary source of impairment for virtually all the other streams listed. Despite this, the Christina River Basin TMDL provides little discussion of the limiting nutrient and its importance in properly addressing the nutrient pollution problems in the watershed.	J.R.May	This TMDL is established to address the critical condition of low flow. Nonpoint source loads assessed as background conditions are incorporated in the TMDL (see 11-L-10). A full evaluation of nonpoint source loads under high flow conditions will be made in the high flow TMDL. The limiting nutrient issue under low-flow conditions is discussed in the Decision Rationale document. See 11-L-23.
11-L-25	The TMDL model used to develop the proposed TMDLs is too flawed to be relied on for the Christina River Basin TMDLs	J.R.May	EPA disagrees. The TMDL model was calibrated using data collected in 1997 and validated using data collected in 1995 with both years experiencing low-flow periods comparable to 7Q10 conditions used for the low flow TMDL. The results of the calibration and validation are presented in the Model Report. As presented in Section 11 of the Model Report, relative error statistics for dissolved oxygen, carbon, nitrogen, and phosphorus are within the acceptable guidance for water quality models published in Technical Guidance Manual for Performing Waste Load Allocations, EPA, 1990.
11-L-26	According to section 3.1 of the model report, the EFDC model was originally developed for estuarine and coastal applications.The commentors believe the model developer needs to provide more assurance that the model is indeed appropriate for simulating the Christina River Basin.	J.R.May	The TMDL model was originally applied to estuary situations. However, it is a general water quality model applicable to both freshwater and estuarine waterbodies. A full description of the processes incorporated in the model can be found in Sections 3, 4, and 5 of the Model Report. The EFDC model has been applied to support nutrient and dissolved oxygen analysis for TMDLs and water quality studies in the following freshwater systems: Yazoo River, Mississippi; Ochlockonee River Basin, Georgia; Satilla River Basin, Georgia; Suwanee River Basin, Georgia; St. Marys River Basin, Georgia; Lake Tenkiller, Oklahoma; Lake Wister, Oklahoma; Los Angeles River, California; and East Fork Little Miami River, Ohio.
11-L-27	However, the model document provides little assurance that the sediment model used here is appropriate for simulating the actual conditions in the Christina River Basin.	J.R.May	A complete description of the processes incorporated in the sediment diagenesis model is described in Section 5 of the Model Report.

TMDL ID #	Comment	Commenter	Response
11-L-28	However, to calibrate the model, the modelers inappropriately used the characteristic low-flow/background concentrations of pollutants (that is, the lowest concentrations from NPS) and assumed that this background concentration remained constant over time, even though the flow rate in the model calibration was varied based on flow-rate data collected in 1997.	J.R.May	The TMDL model was calibrated for summer low-flow conditions, therefore EPA determined it appropriate to use low-flow (background) concentrations of pollutants for the nonpoint source inputs to the model. The intent of the low flow TMDL was to focus on the critical condition of low flow. The high flow TMDL will consider variable flow conditions and will incorporate varying nonpoint source loads.
11-L-29	By keeping the NPS concentrations set to a constant minimum throughout the model calibration, the model must have significantly underestimated the amount of nutrients contributed from nonpoint sources.	J.R.May	Since actual monitoring data were used to determine nonpoint source loads, the estimates of amount of nutrients contributed from nonpoint sources are as accurate as any watershed runoff model would provide during low-flow drought conditions. The nonpoint source loads are kept at a constant minimum as this TMDL is established for critical low-flow condition when nonpoint source loads should not vary from the estimated values incorporated in the model.
11-L-30	Even though the HSPF model is not yet available, the modelers are still responsible for making sure a realistic estimate of NPS loading was included in the model calibration. Using the bare minimum concentration as the "constant" value is completely inappropriate and certainly not a "conservative" assumption. The commentors assert that without a realistic estimate of NPS nutrient concentrations, the model calibration is invalid.	J.R.May	EPA disagrees. Actual monitoring data were used to determine nonpoint source loads for the TMDL model during the summer low-flow steady-state conditions. This method for estimating nonpoint source loads is reasonable and accurate for low-flow conditions.
11-L-31	Section 5.6.2 on "Boundary and Initial Conditions" for the Sediment Model also raises concern, because the boundary conditions used in the sediment model include the overlying water conditions taken from the water column water quality model.	J.R.May	Large storm events tend to scour the stream bed and wash away large amounts of deposited sediment and organic material. During low-flow periods, the locations of sediment deposition are primarily in the nearby vicinity of point sources. The TMDL model has shown that these deposition areas exist in the vicinity of the larger point source facilities (see the sediment flux results in Appendix D of the Model Report).
11-L-32	The commentors question whether the assumptions made in the model result in a severe underestimate the amount of nutrients in the sediment.	J.R.May	No sediment monitoring data were available to corroborate the TMDL model estimates of benthic nutrient flux rates with the exception of three sediment oxygen demand samples in the tidal Christina River. Based on previous applications of this TMDL model, the benthic nutrient flux rates calculated by the model are reasonable.

TMDL ID #	Comment	Commenter	Response
11-L-33	The TMDL inappropriately uses average NPDES permit limits for analysis of in-stream minimum DO levels rather than maximum permit limits. Where values are given for permit limits or allocations, it is never stated how the numbers are applied--that is as average or maximum. With DO, average discharge values should be used in assessing compliance with average standards, and maximum discharge values used for minimum standards. While the draft TMDL document states that NPDES point source permits were analyzed based on maximum flows and concentrations (see draft TMDL pages 23 and 67), a review of additional information reveals that this is not the case.	J.R.May	Monthly average permit flows and loads for the NPDES facilities were used for the TMDL model runs. The use of monthly average NPDES permit limits for the TMDL analysis is appropriate for the low-flow, steady-state conditions. The daily maximum permit limits are intended to enforce compliance with meeting reasonable loads during periods of when the inherent variability of effluent conditions are considered. This inherent variability stems from a number of factors, including fluctuations in wasteflow or waste strength and changes in operating efficiency as a result of changes in temperature, equipment operating characteristics, etc. During drought summer conditions, it is not reasonable to expect that the daily maximum permit flows and loads would ever occur since by definition a drought is a condition absent of significant rainfall. The analysis of the daily average and minimum DO water quality standards do not depend on the average and maximum permit values. The minimum DO is a function of the diel (24-hour period) photosynthesis and respiration processes in the stream. A quick transient increase in loading from a NPDES facility (i.e., the daily maximum load) will not have a significant impact on either the daily average DO or the diel oxygen range. It is the persistent long-term average load that drives the algae growth and hence the photosynthesis and respiration. The TMDL was properly determined using monthly average permit limits.

TMDL ID #	Comment	Commenter	Response
11-L-34	Using the example of the Kennett Square (NPDES permit No. PA0024058) discharge to West Branch Red Clay Creek, the CBOD5 limit is given in the draft TMDL as 25 mg/l, but it is never stated if this is the monthly or weekly average limit, or the daily maximum. The flow is given as 1.1 mgd, but this too is not defined in terms of average or maximum. The commentor obtained a copy of relevant portions of the permit and found that in fact, the 25 mg/1 limit for CBOD5 is the monthly average, with a weekly average limit of 40 mg/l. The permit also contains a CBOD5 limit of 50 mg/1 as "Inst. Max" (which is not defined), and the daily maximum column for this parameter in the permit is blank. It thus appears that a more accurate representation of the maximum permitted concentration for the draft TMDL to be using for CBOD5 is 50 mg/l. As presently modeled with the 25 mg/! value, the daily maximum load would be underestimated by a factor of 50%. The same is true of other permitted parameters, such as ammonia.	J.R.May	Monthly average permit flows and loads were consistently used for all the NPDES facilities in this TMDL. The monthly average value of 25 mg/l CBOD5 for Kennett Square is the appropriate value for the TMDL analysis. See 11-L-33 for a discussion of the daily maximum permit limits.
11-L-35	Other permits associated with these TMDLs have not been similarly reviewed, but it is likely that this problem persists for all. In general, when comparing standards, permit limits, and TMDL allocations, consistency should be used so as to avoid "apple and orange" comparisons and to avoid underestimations of daily.maximum load impacts as allowed by permit limits and TMDLs.	J.R.May	Monthly average permit flows and loads were consistently used for all the NPDES facilities in this TMDL as discussed in 01-A-03, 11-L-33 and 11-L-34.
11-L-36	The Christina River Basin EFDC Model simulates the hydrodynamics of the basin reasonably well. Its water quality simulation, however, misses by a wide mark the important biochemical processes under the critical 7Q10 low flow condition for which the Draft TMDL was developed. This model failure is manifested in underestimating of downstream accumulations of organic carbon produced by photosynthesis in upstream tributaries, and overestimating of dissolved oxygen at these downstream locations. The differences between observed data and model estimates in transect plots for the August 1995 model verification show how the model failed to accurately predict photosynthesis and DO levels.	J.R.May	Thank you for the positive comment on the TMDL model simulation of Christina River Basin hydrodynamics. Regarding the comment on biochemical processes, EPA does not agree that this TMDL model “misses by a wide mark the important biological processes...” The overall relative error for DO in the August 1995 validation was 6.3%. This is well within the acceptable guidance (15%) for water quality models published in Technical Guidance Manual for Performing Waste Load Allocations, EPA, 1990.

TMDL ID #	Comment	Commenter	Response
11-L-37	In Figure E01, model estimates for dissolved oxygen and total organic carbon diverge substantially from the observed contemporaneous data at downstream river miles 78, 82, and 87 on the main stem Brandywine Creek.	J.R.May	EPA disagrees. In Figure E01 of the Model Report, the TMDL model DO agrees very well with the 4 of the 5 observation locations on the main stem Brandywine Creek. The model maximum total organic carbon (TOC) follows the observed trend of increasing concentration in the downstream direction. Since the observed data are grab samples, not averages, it is reasonable to assume that the model envelope defined by the minimum and maximum values capture the essence of the observed TOC trend.
11-L-38	In Figure E13, total organic carbon is underestimated throughout the tidal Christina River and, in Figure E16, dissolved oxygen is overestimated at the downstream non-tidal Christina River at miles 89.5 and 96.5	J.R.May	EPA disagrees. In Figure E13, the DO average and minimum/maximum range follows the observations extremely well throughout the tidal Christina River. Total organic carbon simulated by the TMDL model is slightly less than the observations near mile 81 on the tidal Christina River. The reason for this is thought to be due to organic material originating in Churchman's Marsh which was not included in the TMDL model.
11-L-39	The same overestimation of dissolved oxygen and underestimating of organic carbon by the model are seen in Figure E19 for main stem Red Clay Creek at downstream river miles 88 and 92.5, and in Figure E25 for White Clay Creek at downstream river miles 89, 91, and 100.5. It is seen again in Figure E31 for river mile 74 on the Delaware River.	J.R.May	In Figure E19 in the Model Report, at the downstream location on main stem Red Clay Creek, the TMDL model DO is slightly higher than the observations for the 1995 validation run. However, for the 1997 calibration run, the DO observations fall within the TMDL model diel range (Figure A19). Also, the TMDL model simulation of total organic carbon agrees with the observations better in the 1997 calibration run than the 1995 validation run. When assessing model performance, both the calibration and validation should be considered together. In Figure E25 (validation) and Figure A25 (calibration), the TMDL model agrees well with dissolved organic carbon. In Figure A25, the model DO agrees with the observed data at all four sampling locations on White Clay Creek. In the Delaware River, the model DO agrees very well with the observed data during the 1997 calibration (Figure A31) and is slightly less than the observations in the 1995 validation run (Figure E31).

TMDL ID #	Comment	Commenter	Response
11-L-40	Associated with this model's failure to simulate biochemical processes critical to water quality in the Christina River basin, concentrations of ammonia-nitrogen are consistently and significantly underestimated for the downstream stations (Figures E02, E 14, E 17, E20, E26, E32).	J.R.May	EPA disagrees. The TMDL model simulates the concentrations of ammonia nitrogen well for the downstream stations as shown in Figures A05, A20, A29, A32, E08, and E20. As presented in Section 11 of the Model Report, relative error statistics for DO, carbon, nitrogen, and phosphorus are within the acceptable guidance for water quality models published in Technical Guidance Manual for Performing Waste Load Allocations, EPA, 1990.

TMDL ID #	Comment	Commenter	Response
11-L-41	As mathematically and computationally complex as is EFDC and related water quality simulation models, their representations of dynamic biological processes are still simplistic approximations of the natural reality. It is an arduous and time consuming task to fit these models' mathematical estimations to the uncooperative data from the natural world. With all the demonstrable uncertainties and opportunities for error inherent in these models, the commentors question whether this effort is an appropriate application of resources to TMDL development	J.R.May	Those who do not fully understand the concepts of water quality modeling often mistakenly assume that the more sophisticated the model is the less useful it is due to the increase in data needs. We disagree with the misconception. Some of those same people would recommend a very simple approach to the development of all TMDLs by using an oversimplified mass balance approach. We believe that the level of model sophistication should be based on several factors including the type of pollutant, the data available, the problem to be solved and the implications the resolution will have on the sources of the pollutant. While the more sophisticated approach attempts to quantify and identify various instream processes through the use of environmental data, the oversimplified approach takes nothing into consideration, except the very basic concept of dilution. One may recommend a simple mass balance for phosphorous for example to address the nutrient problem. This has many problems such as the lack of water quality standards for the pollutant and the fact that no instream processes, with respect to either the contributions of the pollutant from other sources (point, nonpoint or sediment) or the loss of the pollutant through instream processes, are factored into the calculations. Simplifying the TMDL process down to a very simple calculation based on no local environmental data does disservice to both the environmental goals as well as the point source and land owners that must commit resources to meet the TMDL. Modeling dynamic biological processes is a long history of success. EPA firmly believes that the approach used in this TMDL, even with some limitations, outweighs by a large margin, the oversimplified, pedestrian approach of back-of-the-envelope approach advocated by those not fully knowledgeable in the concepts of water quality modeling.

TMDL ID #	Comment	Commenter	Response
11-L-42	Development of the proposed TMDL focuses wrongly on the carbon-oxygen cycle in water quality determinations. This view of photosynthesis and respiration as the production and oxidation of simple sugars may be in a limited way technically correct, but it is entirely misleading from the biochemical processes that occur in natural waters. A more usefully complete description of photosynthesis and respiration processes in the Christina River basin should include the critical role of the problematic nutrients that control these processes.	J.R.May	The model used for this TMDL considered the impacts of carbon, nitrogen, and phosphorus on oxygen (see Section 4 of the Model Report for a more detailed description).
11-L-43	The Draft TMDL appears to satisfy the TMDL targets for dissolved oxygen only because the TMDL was developed from a "critical condition analysis" in which the critical condition was a steady-state, i.e., photosynthesis and respiration were assumed to be occurring steadily and simultaneously (though perhaps fluctuating diurnally) at each place in the basin. For this assumed condition, dissolved oxygen production and depletion balance out over the day with little calculated impact on daily averaged levels of dissolved oxygen. But this is an artificial and unstable condition for nutrient-enriched waters. The appropriate critical condition for these waters is not the low flow steady-state week of bright sunshine, but the following several days of low flow and cloudy overcast weather. During these critical days, the accumulated steady-state growth will cease, decompose, and rapidly consume oxygen without replenishment by photosynthesis. During these critical days, the 38,780 pounds of oxygen demand stimulated by the phosphorus load in the Christina River TMDL will be exerted. During these critical days, the Draft TMDL targets for dissolved oxygen will be widely missed.	J.R.May	EPA disagrees with certain assumptions of this comment, and therefore its conclusion. Algae growth responds to both direct and diffuse solar radiation. On cloudy days, diffuse solar radiation reaches algae in the stream and growth continues, although at a slower rate. To imply that all algal matter in a stream will cease growing and decompose due to overcast conditions is not reasonable nor accurate. The algal growth rate will slow to a certain extent, but the entire algal biomass will certainly not suddenly decompose and exert its entire demand on oxygen.

TMDL ID #	Comment	Commenter	Response
11-L-44	Though many portions of the streams in the Christina River Basin are shaded by canopy cover, the model-assumes no shade in the entire basin due to a lack of data on canopy cover. (Model report, Section 12.4, p. 12-4.) As the model report admits, "[v]egetative cover shields many portions of the stream reaches from direct sunshine, which can have a profound effect on localized chlorophyll photosynthesis." (Model report, p. 12-4.) This affects the resulting DO levels in the shaded areas of the stream and skews the DO levels predicted by the model. As a result, model results which predict compliance with DO standards after TMDL implementation are unreliable.	J.R.May	The TMDL model incorporates a shade factor which can be applied individually to each grid element to account for shading effects. It was decided to assume no shade anywhere in the Christina River Basin to represent worst-case critical conditions and increase the implicit margin of safety. See 04-D-04A.
11-L-45	The model appears to indicate a peak biomass in early May and late September, rather than during the height of the growing season in mid-summer. This is further evidence of the model's ineffectiveness in modeling the Christina River Basin for low-flow, late summer conditions, when the risk of water quality violations related to excess biomass is at its highest.	J.R.May	As noted in the comment, the TMDL model correctly estimates peak biomass in the month of September which corresponds to the period of low-flow that usually occurs in late summer and early fall. See 04-D-04C.
11-L-46	The modelers could not calibrate or validate the Buck Run segment or validate the White Clay Creek East Branch segment because no actual data was available for comparison to the model. Despite this, the modelers state that "[c]omparisons of predicted and observed data for all parameters were considered to be reasonable in all 11 major stream reaches included in the model." (Section 12.3 of model report.) Contrary to the modelers' assertion, no reasonable basis exists for believing the Buck Run and White Clay Creek East Branch segments of the model reflect actual conditions.	J.R.May	This comment correctly states that no observed data were available for Buck Run during either the calibration or validation periods, therefore, it cannot be conclusively stated that the simulation results are reasonable in this stream segment. However, the kinetic rates and hydraulic parameters developed for Buck Run were similar to the other stream segments in the TMDL model, so there is reason to believe the simulation results should behave similar to the other streams in the model. Also, the comment correctly states that no observed data were available for East Branch White Clay Creek during the validation period. However, data were available in East Branch White Clay Creek during the calibration period and model-data comparisons were reasonable during that time period.

TMDL ID #	Comment	Commenter	Response
11-L-47	The EPA should consider alternative approaches to developing the TMDL, particularly since the HSPF model for nonpoint source pollution is not yet available. For example, a more reliable and straightforward approach to an effective Christina River Basin TMDL would be to first establish the allowable total phosphorus loadings that would achieve a target instream criterion of 0.1 mg/1 total phosphorus during the critical low flow condition in main stem reaches of Brandywine, Red Clay, and White Clay Creeks and the Christina River.	J.R.May	EPA is confident that the approach used in developing this TMDL is appropriate. The suggested use of 0.1 mg/l phosphorous value would not be appropriate as this value is not an applicable water quality criterion, nor is necessary to achieve and maintain DO water quality standards. See 11-L-20.
11-L-48	The commentors are concerned about the numerous conclusory statements made without providing any supporting data or explanation, or in some cases, made in contradiction to the data or figures presented. For example, on page 20 of the main TMDL document the statement is made that the calibrated and validated water quality model confirmed "that the model was able to simulate the locations of the impaired stream segments on the 303(d) list." However, as pointed out in Section I of these comments, the model in fact did NOT predict low DO in several stream segments specifically listed for low DO on the PA and DE 303(d) lists.	J.R.May	The available monitoring data for some of the streams listed for low DO on the state 303(d) lists did not indicate any impairment of the water quality standards for DO. For example, no monitoring data were available for Buck Run to confirm that the DO concentrations were below the water quality standards. Therefore, without supporting monitoring data it was not possible or desirable to configure the model to predict violations of the DO standard
11-L-49	Another statement made without support or explanation is the brief mention of water quality criteria for nitrate-nitrogen and ammonia-nitrogen on p. 29. The text claims that the pollutant load reductions necessary to maintain the criteria for dissolved oxygen result in the Christina River basin also meeting state criteria for nitrate-nitrogen and ammonia-nitrogen. No explanation for how or why this is true is included anywhere in the TMDL.	J.R.May	Following pollutant load reductions necessary to maintain applicable water-quality standards for DO, the TMDL model was run to determine the resulting levels of ammonia-nitrogen and nitrate-nitrogen in the model segments at those discharge levels. The TMDL model indicated that at pollutant loading levels necessary to maintain DO standards, the applicable water quality criteria for nitrate-nitrogen and ammonia-nitrogen are also maintained. The purpose of this exercise was to ensure that nutrient-related parameters, for which numeric water quality criteria exist, are maintained in the Christina River Basin.

TMDL ID #	Comment	Commenter	Response
11-L-50	The TMDLs as summarized in Table 8 and Tables 12 through 28 fail to provide any comparison of the proposed TMDLs to current loading conditions. The only comparisons are to percent reductions from permit limits, not actual loads. Since some point sources operate well below their permit limits, the percentages provided are deceptive.	J.R.May	Current actual loading conditions for point sources are used during the calibration and validation stages of developing the water quality model. Current maximum allowable permit limits for point sources, on the other hand, are used during the critical condition analysis and form the baseline loading levels from which EPA makes reductions to point sources in order to meet water quality criteria for DO during low-flow conditions. Therefore, it is appropriate to include percent reductions to current permitted levels since these are used as the basis for point source loads during TMDL analysis and allocation.
11-L-51	The commentors request that the final TMDL present a comparison of TMDLs to current permit limits and to current operating levels to provide a fairer comparison of current loads to proposed reductions in loads. The commentors also request that complete point source discharge data used in model calibration be included in the TMDL document.	J.R.May	The revised Level 1 and Level 2 Point Source Allocations table summarizing the proposed TMDL reduction that is included in the Executive Summary, and incorporated in the Decision Rationale document contains the current monthly average permit limits for all facilities. A brief summary of recent performance data for the major dischargers in the Christina River Basin from this list has been added to the TMDL Decision Rationale document. Complete information on all discharger limits is provided in the Model Report.
11-L-52	The main TMDL document provides pages and pages of "filler" material that is not specific to the Christina River Basin or the actual TMDL proposed by the EPA. For example, the first section provides only historical background to the TMDL development process, and many later sections contain long paragraphs that discuss EPA strategies and goals for water quality modeling and allocation procedures. While this may be useful background material, it belongs in a separate policy document or in an appendix. The body of the TMDL needs to provide more detailed, more specific information about this watershed, this model, and this TMDL.	J.R.May	EPA believes that the Decision Rationale document provides all required information necessary to justify the decision regarding the Christina River Basin TMDL. The Decision Rationale document is not intended to be a technical document and is meant to provide the reader with information necessary to determine if EPA has adequately addressed its legal, regulatory, and statutory obligations. Historical information and other background material is necessary to justify the time period used to develop this TMDL. The Decision Rationale document also contains citations to additional technical documents available for further information.

TMDL ID #	Comment	Commenter	Response
11-L-53	In addition, more specific information about the water quality problems in the Christina River Basin should be provided in the main TMDL document, for example, an explanation of how nutrient impairment manifests itself in the streams identified in the 303(d) lists (algae blooms, toxicity to fish, etc.). Currently, only general educational information about nutrient impairment is provided. The information should be tailored to explain the problems experienced in the Christina River Basin and how TMDL implementation will improve the water quality.	J.R.May	The Decision Rationale document provides references to the technical reports used to develop the TMDL including the water quality characterization report developed by Dr. John Davis. These documents are available upon request. EPA does not feel it is necessary to include the majority of this highly technical information in the Decision Rationale document. Summaries and references to these documents are provided throughout the Decision Rationale document.
11-L-54	Critical information about the model used and the underlying assumptions made during TMDL development are not anywhere in the TMDL document or its appendices. This information is found only in the Hydrodynamic and Water Quality Model of Christina River Basin final report published May 31, 2000, a document which is not easily available to the public for review. Key information from this report should be summarized and explained in the main TMDL document.	J.R.May	The Decision Rationale document adequately summarizes the TMDL model. EPA provided an overview of the TMDL model at both public information meetings. On several occasions, EPA announced that copies of the Model Report would be provided to any one wishing to have a copy. All requests for copies of the Model Report were honored.
11-L-55	In addition, the TMDL needs to provide much more extensive discussion of the sources of nonpoint source pollution in the Basin, including agricultural runoff, urban runoff, septic systems, and groundwater, and how these loads affect water quality during low-flow conditions.	J.R.May	The TMDL Decision Rationale document provides an adequate discussion of nonpoint source loads and their resulting impacts on low flow conditions. Nonpoint source loads are adequately accounted for in the Christina River Basin water-quality TMDL model. EPA utilized data from STORET, USGS, DEP, and DNREC to develop characteristic nonpoint source loads for parameters of concern from each of the 39 subwatersheds during critical low flow conditions. These characteristic loads are used by the model during development of the allocation scenarios to represent nonpoint source pollutant contributions. Furthermore, those characteristic loads are representative of baseflow contributions (considered the dominant nonpoint source during critical low-flow conditions) as well as expected land-based, nonpoint source during critical low-flow conditions. See 11-L-10.

TMDL ID #	Comment	Commenter	Response
11-L-56	The TMDL also fails to calculate existing loads for each impaired stream segment and fails to identify the current WLAs and LAs in these segments.	J.R.May	Tables 12 through 27 in the TMDL Decision Rationale document provide specific waste load allocations for dischargers in the Christina River Basin as well as load allocations for subwatersheds in the Christina River Basin. All segments identified in TMDL modeling work with DO concerns from point source impacts or under low flow conditions are included in these tables.
11-L-57	It also fails to identify whether any reserve capacity exists in the Christina River Basin.	J.R.May	This TMDL has been prepared under the current and effective requirements of the regulations in place. The requirement to provide for reserve capacity in the TMDL calculations is found in the recently revised regulations which are not yet effective. (65 Federal Register 43586-43670 7/13/00) Sincse they are not yet effective, the Christina River Basin TMDL does not have to include this. See the discussion at 65 Federal Register 43660 on the effective date of the revised regulations.
11-L-58	The presentation of Level 1 and Level 2 allocations is confusing, especially because two of the point sources in the Level 1 allocation (Table 10) are not listed in the Level 2 allocation (Table 11). All 12 point sources that receive allocations should be listed in Table 11, with an indication that two of the sources were not reduced further in Level 2.	J.R.May	To clear up any confusion, EPA has prepared a new summary table and has included it in the Executive Summary of the Decision Rationale document.
11-L-59	The discussion of effluent trading between nonpoint sources and point sources (pp. 48-49) should be deleted from this TMDL since by the EPA's own admission it cannot be implemented until the Stage II (high-flow) TMDL is complete.	J.R.May	EPA believes it is important to specify that opportunities for effluent trading between point and nonpoint sources may become available following development of the high flow TMDL. Excluding this from the document may have caused some to believe that this type of trading would never be applicable.
11-L-60	A very helpful discussion of the relevant state and DRBC water quality standards, regulations, and guidance pertaining to DO and nutrients was present in a 5/27/99 draft of the TMDL ("Chapter I" of what is now in Appendix A) but deleted in the final draft TMDL. The commentors suggest that this information be included in the final version of the TMDL.	J.R.May	Information on relevant state and DRBC standards on DO and nutrients is provided in Section VII.1 of the Decision Rationale document. (Note: the document cited in this comment was not a draft of the TMDL Decision Rationale document. The document was a draft report on water quality conditions in the Christina Basin prepared by a consultant for DRBC. Material from this document was incorporated in the draft TMDL Decision Rationale document issued by EPA, as well as provided at the Christina TMDL web site. The document cited was never issued by either the DRBC or EPA.)

TMDL ID #	Comment	Commenter	Response
11-L-61	The commentors also note that pH criteria were included in the 5/27/99 draft, but deleted from the final draft TMDL, despite numerous pH criteria violations in the Brandywine Creek watershed. This significant deletion requires explanation.	J.R.May	Water Quality Standards for dissolved oxygen, not pH, are used as the water quality target of this TMDL. EPA believes that the pH criteria violations are directly coupled with photosynthesis and respiration which occurs in the stream in response to excess nutrient loading. EPA further believes that controls on nutrients as established in this TMDL will address the pH violations.
11-L-62	Although the document states that atmospheric deposition rates are considered in the model and the resulting TMDL, it does not specify whether the atmospheric loads are included in the load allocations in Table 8.	J.R.May	The Decislion Rationale document has been revised to include specific data on atmospheric loads. Tables 12-28 now contain an entry for atmospheric loads in the load allocations for each watershed. The summary totals in Table 8 for load allocations now include the atmospheric loads.
11-L-63	The implementation strategies discussed in the TMDL document are deficient because they lack any nonpoint source pollution controls and require no load reductions from any but 12 point sources.	J.R.May	Under current and effective TMDL regulations, there are presently no requirements for inclusion of implementation strategies in this TMDL (see notation in 11-L-57on the revised TMDL regulations). EPA has outlined the probable mechanism (the NPDES permit process) for accomplishing the required point source reduction.
11-L-64	In addition, the commentors strongly recommend that the implementation plan include an extensive monitoring program to measure the effectiveness of this TMDL in meeting water quality standards and to improve the data available for the next phase of TMDL development.	J.R.May	As this low flow TMDL deals principally with point source dischargers and their effects on water quality in the Christina River Basin, compliance monitoring for the point source dischargers and ongoing ambient efforts by the states should address the request made by this comment to expand monitoring.

TMDL ID #	Comment	Commenter	Response
11-L-65	The TMDL requires no reductions from current low-flow loads and assumes no increase in loads in the foreseeable future, despite data showing increasing nitrogen-nitrate loads through the 1990s. The final sentence in the TMDL makes the outrageous, unsupportable statement that "the feasibility of control measures necessary to reduce current nonpoint source pollutant loadings is highly questionable. "The commentors are perplexed at the EPA's position on the effectiveness of nonpoint source-pollution control measures, particularly in light of recent efforts by the states, encouraged by the EPA, to implement BMPs to reduce nonpoint source pollution. Even if this statement is intended to apply only to NPS loads during critical low flows, when NPS loads may be predominantly from difficult-to-control sources such as groundwater, the EPA must clarify its position and acknowledge that nonpoint source controls must be implemented in order to reduce over-land pollutant loads during storm events and high-flow periods.	J.R.May	EPA believes that nonpoint source control mechanisms, such as BMPs, must be implemented to control overland sources of pollutant loadings during precipitation events and high flow periods. The statement “the feasibility of control measures necessary to reduce current nonpoint source pollutant loadings is highly questionable” is applicable within the context of the critical conditions of this TMDL. The lack of precipitation events, as is typical during critical low-flow conditions, causes one to question the effectiveness of traditional BMP measures which are designed on the premise of overland flow. This statement is also meant to clarify why EPA believes that reductions in point sources are necessary during critical conditions to provide reasonable assurance that the TMDL can be met. The Decision Rationale document will be revised to address this issue.
11-L-66	As discussed earlier in these comments, nonpoint source pollution contributes significantly to water quality impairment in the Christina River Basin, and in some stream segments is the only source of impairment. As a result, NPS controls must be part of the implementation plan in order to provide reasonable assurance that water quality standards will be met. The implementation of point source reductions alone does not provide reasonable assurance these standards will be met, particularly for those stream segments solely or significantly impaired by nonpoint sources of pollution.	J.R.May	As this TMDL is for specific low-flow conditions and nonpoint source loads have been adequately accounted for as background conditions, the TMDL will not call for additional nonpoint controls. Many nonpoint source BMPs have been installed in the Christina River Basin voluntarily. Additional nonpoint source controls will be considered in the high flow TMDL.
11-L-67	The feasibility of implementing controls on small point sources should not be discounted from the implementation plan. One option is to prohibit further individual home sewage discharges, especially to small tributary streams.	J.R.May	The Decision Rationale document contains a discussion of an analysis of 87 small point sources (less than .25mgd each). These dischargers were grouped and evaluated in a single run of the TMDL model. Average and minimum DO standards were shown to be protected throughout the watershed as a result of this model run. Any possibility of a ban on future small dischargers in Christina River Basin is beyond the scope of this TMDL.

TMDL ID #	Comment	Commenter	Response
11-L-68	The only way to improve this TMDL in the future and to improve the model used for future TMDL development is to measure the effectiveness of this TMDL in meeting water quality standards. To do this, an extensive monitoring program should be required as part of the TMDL implementation.	J.R.May	Specific features of the implementation plans for the Christina TMDL will be provided subsequently by the states. As this low flow TMDL deals principally with point source dischargers and their effects on water quality in the Christina River Basin, compliance monitoring for the point source dischargers and ongoing ambient efforts by the states should address the request made by this comment.
11-L-69	The comments above demonstrate why the TMDL does not, in fact, incorporate conservative assumptions. As a result, it is inappropriate for the EPA to claim that a margin of safety is implicit in the TMDL. The inability of the model to predict current impairment, the lack of data to calibrate or validate portions of the model, the failure to adequately account for nonpoint loads, and the lack of stream canopy data all make the TMDL unreliable. As a result, an explicit margin of safety must be included in this TMDL to account for the inadequacies of the model and the data.	J.R.May	EPA disagrees with the commenter's assertion that an explicit margin of safety must be used in this TMDL. EPA does not agree with some of the claims contained within this comment. We do not agree that the model does not predict existing impairment and that the model does not include nonpoint source loads. We have addressed the canopy issue elsewhere. EPA guidance suggests that the margin of safety (MOS) can be either explicitly or implicitly or both. Considering the MOS through the implicit approach is based on the use of conservative assumptions within the modeling activities. These conservative assumptions can include the use of the design effluent flows, the 95th percentile stream temperature, low flow stream flow, etc. This modeling activity uses the implicit approach. EPA believes that this use of conservative assumptions in this case adequately addresses the MOS requirement.
11-L-70	Commentor Dr. Barry Sulkin recommends using the relative error values as a basis for establishing explicit MOS values. (See page 11-3 of the model report.) In addition, Dr. Sulkin notes that errors in the model's predictions of maximum and minimum DO levels for the low-flow calibration and validation periods should be quantified and used to establish an explicit MOS.	J.R.May	The use of the relative error for establishing an explicit margin of safety (MOS) would be appropriate if the TMDL analysis was conducted using a dynamic modeling approach rather than a steady-state approach. An explicit MOS may be appropriate for the high flow TMDL.
12-M-01	The TMDL offers a fair and reasonable mechanism to reduce permitted discharges that have long been known to contribute to the degradation of the basins waters. And as mandated in Federal regulations, the TMDL appropriately addresses critical low flow conditions, at which water quality aquatic life are most vulnerable. To insure that water quality standards are met and provide feedback on the reliability of the model used to set the TMDL, the Society requests a carefully structured compliance in monitoring the system be instituted.	C. Brown	EPA appreciates the positive comment. As this low flow TMDL deals principally with point source dischargers and their effects on water quality in the Christina River Basin, it is reasonable to assume that compliance monitoring for the point source dischargers and ongoing ambient efforts by the states will cover the request made by this comment.

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12-M-02	Although seemingly ignored in the draft TMDL documents, the problems of pH excursions beyond water quality standards are linked to excessive phosphorus levels has been documented at locations in the basin. We recommend that the monitoring include pH and stream flow at fifteen minute intervals immediately downstream of major dischargers to insure compliance with pH water quality standards.	C. Brown	Specific features of the monitoring requirements for major dischargers will be established through the NPDES permitting process and through the ambient monitoring networks of the states. EPA will review these permits in accordance with the provisions of NPDES delegation agreements. Decisions on pH monitoring will be made by the states. It is unlikely that the monitoring networks will be able to take pH and flow readings at 15 minute intervals below major dischargers. Such readings are being made by USGS on several segments below major dischargers
12-M-03	To increase public confidence in the TMDL, the Society also requests that EPA provide from the final TMDL document clarification of the conservative assumptions used in the application of the model. This is necessary to support the assertion in the draft TMDL report that the implicit margin of safety used is appropriate rather than an explicit numerical margin of safety.	C. Brown	Response to this comment is contained in various other responses (e.g., 11-L-69). Some of the conservative assumptions used in this model and discussed in other responses include, percent cover, the design stream flow, the use of design effluent flow, the design stream temperature and sediment contributions.
12-M-04	Finally, the society urges that in the future the EPA will carefully consider the readers and reviewers of documents available for public review. Aspects of the draft TMDL report and the Christina TMDL website are very confusing because that information is of such a highly technical nature to be presented to the general public in an unambiguous manner to promote meaningful public participation.	C. Brown	EPA acknowledges that the complexity of this highly technical TMDL process makes it difficult to provide clear and concise documents for the general public. Prior to the completion of the final Decision Rationale document, EPA will make efforts to make the document easier to read and comprehend. An Executive Summary will be included in the final Decision Rationale. However, the technical nature of this subject and the need to offer a complete basis for EPA's decision will still dictate a great portion of the content of the final document.

TMDL ID #	Comment	Commenter	Response
13-N-01	Unfortunately, my experience suggests that the public participation that has come of this TMDL has not been carried out in good faith. I won't comment although I agree with Ms. Dahl's comments on what's also needed in the report. I commented last week on the employment of Mr. Robert Struble of the Brandywine Valley Association to in effect operate the public participation comment. I pointed out that he's associated with organizations that are funded by and under the influence of major dischargers. I observe that this is an objection that I have raised over a period of several years to officials of Delaware's Department of Natural Resources who all told me they feel comfortable and would do it over again. Now, the information that I've received as a result of my request of Mr. Merrill, confirmed and I'm also reporting on a conversation I had with Mr. Struble and I will have some exhibits which will be sent to you to appear on the record before the closing of the record on the 15th.	Alan Muller	EPA has no basis to object to the involvement of Mr. Robert Struble in the public participation efforts pertaining to the Christina TMDL. Mr. Struble provided assistance in arranging very productive sessions with representatives of many Christina River Basin dischargers and acted in a neutral manner in conveying an objective summation of the concerns of these dischargers. EPA is, in the end, responsible for the public participation process. EPA has held a full and open process that meets all federal regulatory requirements.
13-N-02	But more to the point it shows no effort to involve public participation into actual key decisions into the development of this hydrodynamic model. Now, what ought to be done if public participation was intended in good faith, was an effort ought to have been made to identify the key decision points or judgment calls associated with the development of the modeling process and involved the public in making those decisions. Rather than making those decisions behind the scenes, obscuring them in pages and pages of obtuse terminology, data and leaving those people who consider themselves advocates for the water quality are essentially non participants and now at the end of the process are forced to say that they find the results unacceptable.	Alan Muller	EPA disagrees with the characterization of the public participation process for the Christina River Basin TMDL as described in this comment. As discussed in the TMDL document, EPA, with the assistance of several participating agencies, conducted an open process throughout the development of the Christina River Basin TMDL. Numerous public meetings were scheduled and the public meeting process culminated in the general information meetings on July 19 and 20, 2000. Public hearings were then held on August 29 and 30, 2000. EPA also developed an internet web site (www.epa.gov/reg3wapd/christina) where many documents relevant to the Christina River Basin TMDL were made available and opportunity provided for submission of comments.
13-N-03	Now, I'm not here to comment in length on the details on the fluid dynamics. But even a superficial examination suggest many problems including the absence of a quantified safety margin, including as I pointed out before that there was no clear response to my question about whether they permitted a twenty-five percent increase in pollutant discharges from the City of Wilmington was considered a model at all. Now, these are serious defects.	Alan Muller	After presentation of this statement at the Wilmington public information meeting on July 19, 2000, EPA asked its Christina River Basin model consultant to evaluate the impacts of the revised Wilmington STP permit. This analysis was performed and the conclusion reached that the revised permit had no impacts on the Christina River Basin TMDL.

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13-N-04	Let's look at if what we have here seems intuitively acceptable and reasonable. I would like to open a panel here and perhaps the record can show that this is a map that was provided by the Water Resources Agency and shows the location of thirty-eight -- sewers existing on the Brandywine Christina Rivers within the City of Wilmington. Now, we've been involved as advocates in trying to get these hooked up and it's a matter of common knowledge in the City of Wilmington if you go down to the river front which is not very far from where we are now, many times the water will be brown and will have a fecal odor and condoms floating by. One can also in other places in the city see fecal in the water. Now, you're telling us that no reductions are required and you're suggesting, in fact, that the water quality in the Christina fundamentally originated down in Coatesville. Now, they do to a degree, but it's intended to imply and I'm afraid that the implication of this is to support an argument of reductions from these gross dischargers that are occurring in Delaware and that are having immediately harmful local effects and a water quality issue and to us that's nonsensical and completely unacceptable.	Alan Muller	The effects of combined sewer overflows in the Christina River Basin will be considered during the development of the high flow TMDL. Under the critical conditions employed in this low flow TMDL, the effects of combined sewer overflows are not present.
13-N-05	Now, the City of Wilmington which has conducted a long drawn out and unscrupulous campaign to avoid the abatement of CSOs indicates in the reports of its own consultants that an overflow is likely to occur at a rate of rainfall of one tenth of an inch per pound. I mention that because it is obviously possible that the overflow in a situation that would not necessarily constitute a high flow condition for the water in the basin at all. So the failure to address this particular impact or even acknowledge the existence of it in the documentation that I've seen strikes us as a serious defect.	Alan Muller	The effects of combined sewer overflows in the Christina River Basin will be considered during the development of the high flow TMDL. Under the critical conditions employed in this low flow TMDL, the effects of combined sewer overflows are not present.

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13-N-06	So because of the manner in which you all tend to compartmentalize the implementation of the Clean Water Act, there's an implication in all of this that perhaps dissolved oxygen is the only thing that is at real issue here. If we would solve that problem that the river would be fine and that's clearly not true. Even if we invest all of the issues that are called out as water quality limitations and TMDL, we'll still have disastrous impaired watershed.	Alan Muller	EPA does not dispute that there are other water quality concerns in the Christina River Basin. This low flow TMDL, however, focuses appropriately on the DO standards for affected segments and establishes reductions necessary to protect these standards under the critical conditions described in the TMDL Decision Rationale document. Additional Christina River Basin concerns will be assessed as part of the high flow TMDL evaluation but EPA asserts that the low flow TMDL establishes a necessary baseline for improvements in the Christina River Basin and the protection of DO standards under the design conditions.